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GREAT BRITAIN. PARLIAMENT

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# REPORT

FROM THE

# COMMITTEE

ON

# THE STATE OF LONDON BRIDGE.

*Ordered, by* The House of Commons, *to be Printed,*
25 *May* 1821.

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# REPORT.

THE COMMITTEE appointed to inquire into the present State of London Bridge, and to consider if any and what Alterations or Improvements are necessary or proper to be made therein, under existing circumstances, and to report their Observations thereupon to the House; and to whom the Report and Minutes taken before the London Bridge Committee last Session, and also the several Petitions which have been presented to the House in the present Session, were referred; and who were empowered to report the Minutes of the Evidence taken before them to the House;—Have, pursuant to the Order of the House, considered the Matters to them referred, and also the Reports presented to the House in the Years 1799, 1800, and 1801, for improving the Port of London, and have agreed upon the following REPORT:

THE Committee appointed in the last session of Parliament having in their Report stated, that it appeared that much inconvenience and damage were occasioned to the craft navigating the river, from the construction of London Bridge, and Your Committee seeing no reason to alter such opinion, they proceeded to inquire into the best means of preventing such inconvenience; and they have annexed to this Report the Evidence which has been adduced before them, together with copies of various documents upon the subject.

A plan was suggested in the year 1814, in a Report made to a Committee of the Corporation of London by Messrs. Dance, Chapman, Alexander, and James Mountague, to enlarge the water-way through the bridge, by substituting four large arches for eight of the present small ones. The expense of effecting such work has recently been estimated at the sum of 92,000*l.* founded on the supposition that the piers are sufficient to sustain the increased weight; but if on examination they should prove insufficient, the expense would be greatly increased. It appears likewise by the evidence of Mr. Rennie and Messrs. William and James Mountague, that no satisfactory mode of ascertaining the strength of such piers can in their opinion be adopted, but by the means of as many coffre dams as there are piers upon which the new arches are to be erected; Mr. Rennie stated that the expense of each coffre dam would be about 18,000*l.* or 20,000*l.* which is not included in the before mentioned estimate.

An excavation has recently been made, by the direction of the Corporation of London, into one of the piers, for the purpose of examining its stability, which Your Committee have inspected; Mr. Chapman, Messrs. Ralph and James Walker, and several Masons, have expressed themselves satisfied with the examination they have thereby been enabled to make, and they are of opinion that a similar examination of the other piers would be sufficient to enable them to form a decided opinion as to the practicability of effecting the proposed alteration; whereas in the opinion of Mr. Rennie, such examination has rather tended to decrease his confidence in the strength of the piers; and Your Committee are of opinion that the reasons he assigns fully justify this conclusion.

Your Committee are further of opinion, that a work of such public importance should not be undertaken without the greatest and most unequivocal certainty of ultimate success, and even if such success could be secured without adopting the expensive mode of examination beforementioned, the comparative advantages which a new Bridge would possess over the old one, which must under any circumstances be supported by starlings, are so great, as to warrant Your Committee in discountenancing the proposed alteration; and it should be observed, that the professional men who proposed the plan of alteration, did not themselves recommend its adoption; but distinctly state that in every respect, except with a view to economy, a new Bridge would be preferable to any alteration of the old. Your Committee, from the evidence adduced, think it extremely doubtful whether a new Bridge will not ultimately be found less expensive than the proposed alteration.

Although Your Committee cannot therefore recommend the adoption of the plan suggested in the before-mentioned Report of Messrs. Dance and others; yet, as it contains much valuable general information upon the subject under consideration, they have thought proper to annex it to their Report.

Your Committee have not been unmindful of the effect which will be produced upon the navigation of the River by the removal of the dam which the present Bridge occasions; upon which subject they refer to the testimony of several of the witnesses examined before them, and particularly to the opinions of Doctor Hutton; the Harbour Masters of the port of London; the Report of Messrs. William Mountague, Rennie, Chapman, and James Mountague; the Report of Mr. James Walker and Mr. Leach; and the evidence given by Mr. Rennie, Mr. Chapman, and Captain Ludlam, before a committee of the Corporation of London; by which it will be seen, that scarcely any difference of opinion exists as to the decided advantages which will be derived by a free current of water through the Bridge. It is evident that such free current will destroy the motive power of the London Bridge waterworks. Your Committee have been furnished with the particulars of a negotiation which has taken place between a committee of the Corporation of London, and the Proprietors of those works, which not having met with a successful termination, and not being within the reference made to Your Committee, it is unnecessary to detail; Your Committee however think it proper to remark, that in the event either of altering or rebuilding the Bridge, the obstruction caused by the waterworks, which are evidently a public nuisance, must be removed.

If the supply of Thames water be necessary to the Public, Your Committee conceive that other means, of a more certain, and, in all probability, of a less expensive nature than those now adopted, may be resorted to, for affording such supply.

Your Committee have made inquiry into the state of the finances applicable to the support of the Bridge, the particulars of which will be found in the evidence annexed to this Report.

After attentively considering all the Evidence, Your Committee are decidedly of opinion, That the present construction of London Bridge causes great impediment to the navigation of the River Thames, and is very injurious to the interests of the owners of the vessels which navigate the river, by occasioning frequent damage to the craft, and the loss of many lives:

That it appears to Your Committee, that the only effectual remedy which can be applied to remove all the inconveniencies and obstructions now existing, is by the entire removal of the present Bridge with the Starlings and Waterworks, and the erecting a new Bridge, with not more than Five Arches:

That it appears to Your Committee, that considering the local interests connected with the approaches to the present Bridge, a new Bridge should be erected on the present site, or as near as possible to the same:

That it appears to Your Committee, that the City of London hold in trust certain large Estates, which were left to and have otherwise become vested in them, for the purpose of sustaining London Bridge; that the yearly rental of such estates, subject to certain charges made thereon by Acts of Parliament and otherwise, and to expenses of management, the particulars of which will appear in the evidence of Mr. Robert Finch Newman, the Bridge House Comptroller, now amount to upwards of 25,800 *l.* and which, upon falling in of leases, will be gradually increased; that the trustees also possess stock and cash, of the present value of 112,000*l.* and which sum is applicable to the same purpose:

Your Committee further state, That in the event of the funds applicable to the proposed works proving insufficient, which they have no reason to believe will be the case, they are of opinion, that adequate means of raising the money may be found, without imposing a toll on passengers passing over the Bridge:

That Your Committee recommend, that a bill be brought into Parliament early in the next session, for carrying into effect their Report; and they also further recommend, that the Notices required by the Standing Orders of the House, preparatory to the execution of such a plan as may finally be approved of, ought to be given by the City Remembrancer, previous to the next Session of Parliament, in order that the work, if sanctioned by Parliament, may proceed without delay.

25 May 1821.

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## MINUTES OF EVIDENCE.

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*Veneris, 23° die Martij,* 1821.

MR. ALDERMAN WOOD,
IN THE CHAIR.

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*Francis Giles, Esq.*

Called; (Examined by Mr. Randle Jackson, on behalf of the Corporation of the City of London.)

*Francis Giles, Esq.*
(23 March.

I BELIEVE you are what is called an engineering surveyor?—Yes.

I believe that you were employed under the immediate directions of Mr. Rennie, for a number of years?—Certainly.

How many years?—For about seventeen years.

Had you occasion during that time, to make many public surveys; and if so, state them?—I made public surveys during the whole of that time.

On the river Thames particularly?—Yes; I made the surveys for the Vauxhall bridge, the Waterloo bridge, the Southwark bridge, and also surveys of the Thames, for the city, from London bridge to Blackwall; for the navy board, from Blackwall to Galleons Reach; and also of Northfleet Hope, &c. for the Trinity house.

Have you surveyed any harbours on the coasts of England and Ireland; and if so, state a few of them?—Yes; the harbours of Margate, Ramsgate, Dover, Rye, Shields, and Sunderland; in Ireland, Dublin bay, Wexford, Donaghadee; and in Scotland, Port Patrick.

How many years altogether, have you been engaged in your present profession?—About seventeen years.

On the 6th of March instant, I believe you surveyed the centre arch of London bridge, in order to ascertain whether any, and what degree of settlement had taken place?—Yes; the cornice of the arch.

Be so good as to state the mode by which you made that survey, and the result?—I used a spirit level, and by placing myself on the cornice with the spirit level, I ascertained the fall from the station where I stood, which was on the south end of the cornice, to the middle, likewise the fall from the south to the north end of the cornice, by which I determined the dip or settlement of the centre of the cornice, below a right line, between the south and north ends of it. I also, from the roadway of the bridge, took the levels from the south end of the cornice to the middle and the north end, by way of proof of the levels which I took upon the cornice.

This mode, according to your experience, was likely to produce an accurate result?—Decidedly so.

State that result?—On the western side, the dip in the centre was two inches and a half below a right line between the south and the north ends of the cornice; the dip on the east side was one inch and three-eighths below the similar line.

Is that what we should term a settlement?—Certainly; by a dip I mean a settlement of the cornice.

You have been many years in the habit of observing London bridge?—I cannot say I have made any particular observations, but during my surveys; I have frequently seen London bridge.

I wish to know, if this settlement in question, appeared to you to be a recent settlement, or one of long standing?—There was no appearance in the bridge at all of its being a recent one.

What time was it you took that survey?—In this month of March, about a fortnight ago; since the Committee sat on this business.

You made the survey, for the express purpose of enabling yourself to give information to this Committee upon the subject?—Certainly.

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*Francis Giles, Esq.* (23 March.)

On what length of line does this settlement appear?—Upon a line of eighty-three feet.

If the settlement had been of a recent nature, should you have been enabled to ascertain that fact?—There would have been visible crevices in the joints of the stones, by which I should have judged that it was new, but no such crevices were apparent.

If the settlement had been recent, would it have appeared more abrupt, would it have been a more visible settlement?—I do not know that the settlement of the cornice would have been more abrupt or confined to one place; but there would have been evidences of it in the appearances of the joints, if it had been recent.

Have you any means, from your experience in bridges and works of this kind, of conjecturing at what period that settlement may have taken place?—I have never attended to the building of bridges, but from my common understanding, I should conceive, that it certainly occurred when the centering was struck.

You yourself have not had any means of ascertaining, whether this depression has increased or diminished within a number of years?—No, I never surveyed it but once.

You have been in the habit of sounding other tidal rivers?—Yes, certainly.

From the nature of a tidal river, is its bed apt to fluctuate in any degree; and if so, explain such a fact to the Committee?—The bed of tidal rivers is always fluctuating, more or less, according to the difference of soils, and according to the obstructions presented to the current of the river, sometimes being in one place, and sometimes another.

Has such an observation occurred to you in any other river than the Thames?—Yes; the latest I can speak to is the river Mersey, at Liverpool, which I am now surveying, the sand banks of which are constantly shifting, so much so, that I have by the level determined a variation between one day and another, of a foot or eighteen inches in different parts of it.

Do you impute that change of the bed you have described in the river Mersey to artificial obstructions, or to the general nature of tidal rivers?—That arises particularly from the loose state of the bottom of the river, it being composed of sand.

Are there any artificial obstructions?—No, they are natural.

Your answer as to that has reference to the river Mersey?—Yes.

From your finding, in particular places, the difference of a foot in a river like the Thames, would that induce you to conclude, that there was a general filling up of the bed to that extent?—Certainly not; I have sounded a great deal of the Thames below London bridge, particularly from Blackwall to Galleons, for the navy board, and the navy board were not satisfied with the first soundings, so that they directed them to be retaken; and, although I sounded again, as nearly as I could in the same places, I could not get precisely the same depths.

Within what intervals of time was that done?—Within two months.

At what distance is London bridge from the sea?—I do not know exactly; it is sixty miles from the Nore.

Did you ever sound any tidal river at that distance from the sea, except the Thames?—No; I have sounded and surveyed the river Wear, and the Tyne; I have also sounded the river Mersey, twenty miles above the sea.

Were there any bridges or bars, or any artificial works of that nature, between the places you sounded and the sea?—No, there was not.

Do you find in the Thames, and such rivers, partial shoals and partial depths, shifting occasionally?—Yes.

Describe your opinion of the effect of these, and how such an effect arises?—There are many causes operating to produce shoals and partial depths in rivers; the principal causes are the different velocities and heights of the tides, the different degrees of strength and quantities of fresh water in those rivers, the nature of the soil brought into them by the fresh waters, as well as the nature of the soil in the bed of the river where the tide acts upon it, the extent of the navigation in them, which occasions removals of shipping and moorings, also the occasional building of wharfs, and other works on the shores of the river; such circumstances are constantly operating to produce those changes alluded to.

*By the Committee.*—And the power of winds?—I include that along with the tides; winds are one great cause of the operation of the tides.

Do you mean that shallows and depths would occasionally change?—Certainly.

Would you be able to sound the river Thames, so as to give information to this Committee, without sounding it from shore to shore; supposing the Committee wished

Francis Giles, Esq.

(23 March.)

wished to know the various depths of the Thames, how would you proceed?—I should take the sounding from one shore to the other; I should take the transverse section of the river.

Have you ever sounded the river Thames above bridge?—No.

Were you desired to make any sounding above bridge?—Nothing further than under London bridge, and below the bridge, also sounding the gulley a little above it, and making transverse sections under all the other bridges, as high up as Westminster; but they were confined to the sections under the bridges.

Would you, or any engineer, have been able to inform this Committee, as to recent filling up of the river, to the extent of a foot or more, without sounding as you have described?—Certainly not without those means; I should be very tender in giving an opinion to that nicety, even with such means.

*By Mr. R. Jackson.*—Have you had occasion to sound that part where a bank was removed some years back, or I believe within two years?—Yes.

You are aware, that the bank was removed about two years ago by the corporation of London?—Yes; I know the spot that was reported to me to have been cleansed by them, and I have sounded that.

Have you taken the transverse section of it?—No, not there.

At low water, what did you find?—The least depth I found was two feet four inches.

Was that at spring tide?—It was at a very low water of spring tide, and stated to be ten feet below the east end of the starling at the south side of the great arch; it was lower than the Trinity average spring tide low water mark, by a difference which I could state from my plan [*witness referring to his plan*] that low water was two feet seven inches below the average low water spring tide, as established by the Trinity board, by act of Parliament in 1800.

Was that the smallest depth of water that you found, or did it vary?—That was the smallest depth.

State what other quantities you found?—The average smallest depth was three feet; but at one place I found it two feet four inches.

What was the greatest depth you found upon the shoals?—It graduated from the depth of three feet into very deep water.

Is there not a difference in the level of the spring tide above and below bridge at the time of high water?—Yes.

State what?—An average difference of eight inches higher upon the lower side than upon the upper side.

What is the average of the fall through the centre arch?—The average fall at spring tides was four feet four inches.

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## *Lunæ*, 26° *die Martij*, 1821.

## MR. ALDERMAN WOOD,

### IN THE CHAIR.

### *Francis Giles, Esq.*

Again called; (Examined by Mr. Randle Jackson.)

Francis Giles, Esq.

(26 March.)

HAVE you any thing to add to your former answer to my question, as to what is the average of the fall through the centre arch?—I found that the average fall at spring tides was four feet four inches; and the average fall at neap tides was two feet one inch; but the least fall at a neap tide which, I observed, was one foot one inch.

### *James Mountague, Esq.*

Called; (Examined by Mr. R. Jackson.)

James Mountague, Esq.

I believe you are the superintendent of the works of London bridge?—Yes.

When was you appointed to that immediate office?—In the year 1815.

You had been surveyor to the committee for improving the port several years before that?—Fifteen years before; and I was, in the years 1799 and 1800, upon the surveys of the bridge with Mr. Dance, and the late Mr. Jessop.

How long have you acted in the surveying of the works of the committee, so as to have

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*James Mountague, Esq.*
(26 March.)

have directed your attention to London bridge amongst other subjects?—From the year 1799 particularly, but I have been in the office of works for 30 years.

In the years 1799, 1800, and 1801, I believe you acted upon surveys, in conjunction with Mr. Rennie?—Not with Mr. Rennie, but with Mr. Dance and Mr. Jessop.

You also was upon the survey of the 23d of February last of the centre arch?—I surveyed the centre arch several times lately, but I do not recollect whether it was upon that date or not.

I will thank you to state the degree of actual depression you found, and your opinion of the cause of that depression?—There is certainly a small depression in the great cornice, which is visible to the eye, but barely visible; I mean the cornice of the great arch.

Of what degree?—I did not level it myself; but I have no doubt of the truth of the statement of the former witness, Mr. Giles, that it does not exceed three inches upon a length of eighty-three feet.

Is it much less, the depression on one side than on the other; on the west than on the east?—Yes, there is a little difference.

To what do you impute that depression, and what is your opinion as to its period of duration?—Having known it generally so many years, I have no doubt in my mind, that the depression that has taken place, took place very shortly after striking the centre of the arch, when the enlargement was made. There are no appearances whatever of fracture in the crown of the arch, which must ensue, if there were any gradual and continued depression.

During the number of years that you have known the bridge, has that depression been in much the same state as it is now, or otherwise?—I have no doubt there has ever been some, but if it had been increasing, it would have been pointed out to me; but so little is the depression, and so little apparent to the eye, that I never noticed it till the last session of Parliament, when the statements were made that there was a depression.

Allow me to ask you, as an architect and engineer, if the decay and depression you have described, would be thought much to affect the striking of an arch of 70 feet, situated as that arch is?—Situated as that arch is, and upon the foundations that that arch has, I am not at all surprized at it; but I should be surprized if it were to take place in the construction of an arch, the foundation of which was of stone to the bed of the river.

Would there be any marks now, if it had happened within seven years, that would have indicated it as being so recent?—Certainly, the arch stones would flush, or break off at the joints; and, exposed as the whole of that arch is to such a rapid current, if there was any gradual sinking, it would soon end in its total ruin.

If there had been a gradual and recent depression, would it have exhibited signs of the approaching fall of the structure?—Yes, certainly.

Now I will call your attention to the state of the starlings; state yourself, if you please, in what state the starlings are now?—They are generally in a very good state; the chapel lock starling is in the worst state, but it is by no means dangerous; it is rather unsightly than dangerous; and that would have been repaired, as the committee's attention was directed to it by me in 1816, but it was not thought discreet to go into the expense of it, as in the case of enlargement of the waterway, that would have been one of the piers and starlings to have been removed; and therefore, when I stated that to the committee, who went on the starling with me, and also gave an opinion as to its safety generally, they directed that no thorough repair should be done, until the decision of the great question of enlargement of waterway,

Do I understand you to say, that as to the chapel lock, although it is unsightly it is not unsafe?—Certainly.

Have you continued always to direct the repairs of the other starlings as they required it?—Yes, doing at the same time only what is necessary to render them perfectly safe, but doing what is done, well, and generally not going into extraordinary expenses, for the same reasons as apply to the reparation of the chapel lock.

Are they not in a state of as much security now, as at any period at which you have known them?—Certainly they are.

You state yourself to have surveyed them jointly with Mr. Dance and Mr. Jessop, formerly?—I did; but I was too young then to join in any report, although I was with them upon the surveys.

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*James Mountague, Esq.* (26 March.)

Was it not your opinion, expressed at that time, or was it your opinion at all, that they were in fact in as good a situation, or better, than for many years past?—Yes; the general reparation of the whole was much better than for many years, as their shape was always attended to; besides being repaired, they have been much improved in their shapes, thereby rendering the waterway more convenient.

Are they in as good a state now as they were then?—Yes, certainly.

Have you had any opportunity of ascertaining, whether the water passes through the piles which immediately support the piers?—No; but I have no reason to believe that it does.

Just describe then how the piles upon which the piers rest are secured; describe that?—I should have reference to the plan [*witness referring accordingly to the plan, and demonstrating it*]; this shows one of the piers, which is stone; this is the starling which surrounds the pier; these starlings are formed by piles, which are driven into the bed of the river; they are close and well driven; I should also say, that with the cross-timbers which tie them together, and the filling in between with chalk, that it is not possible for any filtration of water to pass through the starlings, and from them through the pier; it is an absolute impossibility.

State the extent of the extremities of the starlings from the piers?—They are of different extents.

Keep to the two piers that support the centre arch; give us it each way?—This is to the westward [*demonstrating it on the plan*]; one starling is forty-nine feet nine inches from the cut-water of the pier, and the other is forty-nine feet three inches.

Describe them by north and south?—The north starling, westward, is forty-nine feet nine inches, and the south one, eastward, forty-nine feet three inches; the north starling is thirty-three feet six inches, and south forty-one feet three inches; the width of the starlings between the great arch, is nearly alike on each side; about eleven feet six inches from the inside face of the arch to the outside face of the starling.

What is the state of the piles under the water?—They are perfectly good, in my opinion; and as far as experiments can decide, I can say for certain; for if their defects under low water, as has been described by one witness, could be seen, they could be felt, and therefore I attended at dead low water in this month, and with a long boat-hook tried from the edge of the water to the bottom of the starlings, till we felt the large masses of stone placed at the feet of the piles for their security; on the other (north) side, I could find no opening either, into which the boat-hook could go, and therefore my firm opinion is, that the planking on each side is perfectly sound.

This is all applicable to the starlings of the great arch?—Yes.

If there had been any breach, in point of fact, would it have betrayed itself by the escaping of the chalk?—Certainly it must, and there has not been any chalk, to my knowledge and belief, put upon those starlings for several years past; I mean those particular starlings of the great arch.

Tell us distinctly in what state you find those parts of the piles where the action of the air and water alternately takes place; has that occasioned a degree of rottenness; how do you find them generally?—They are, generally, in a very good state.

You have stated, that you paid attention to their shapes; are you conscious of any diminution of the waterway in any given years, owing to the starlings?—No; it mainly depends upon where the dimensions of the waterway would be taken, because the starlings are so irregular in their shapes; but comparing the dimensions at the present day, as taken many years since, by a centre line right through the bridge, there is not the variation in the waterway of an inch, in my opinion.

Examined by the Committee.

When the starlings were last repaired, was there not a coating put all outside of them, so as to make them wider than before?—Planking only was introduced into the starlings of the great arch, I believe in the great repair in 1793 and 1794; but it was not done under my directions or knowledge at that time.

Did not that make a diminution of the waterway, in point of fact, of thirty-six inches?—Perhaps it may be so, but that refers to the reparations of 1793 and 1794; the dimensions I allude to were taken in 1799, or immediately afterwards.

Since 1794, you do not know of any repairs of the starlings that diminishes the waterway?—No; measuring the waterway precisely in the same line, the diminution is not more than an inch.

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James Mountague, Esq.

(26 March.)

Was not the effect of that casing, such as to widen them on each side above eighteen inches?—Not that I am aware of; in some cases we have widened them at their extremities, but the question originally was as to narrowing the waterway.

If you widen the starling you must narrow the waterway?—Yes, but they have not been widened between the arches.

Have you not made that starling thirty-six inches less than before?—No.

Can you name the starling you allude to?—The St. Mary's.

Is that the one you have recently repaired?—Yes.

Has not the waterway been diminished, in consequence of that reparation, eighteen inches on each side?—Not that I am aware of, nor do I think it has taken place; I should have been exceedingly displeased, being the superintendent of these repairs, had such a thing been done without a communication to me; I do not believe the executive officer would have done so; but he is present, and to him I refer you.

You speak now of St. Mary's lock?—Yes.

Do you know of any other starling which has been lately repaired, and necessarily widened by such repairs?—No, I do not.

By driving in inside piles?—No.

Examined by Mr. R. Jackson.

Have the goodness to describe the nature of the repairs that have taken place in regard to the starlings of St. Mary's lock?—New piles have been substituted for the old ones, and the new piles have not been driven outside of those old piles; in the superintendence I have had of the execution of those works, I must of necessity have seen them, had they been so driven.

Is the external planking of St. Mary's lock new, or how?—It is not planked; only the starlings of the great arch are planked.

*By Committee.*—Has the waterway been diminished in the great arch by the piles you have driven?—No.

*By Mr. R. Jackson.*—In fact, these starlings in St. Mary's lock are not planked or cased?—No.

As to the starlings of the centre arch, do you know if any repairs made there have diminished the waterway?—There has been no repair for years to the great arch.

*By Committee.*—Not since the year 1796?—I think the great arch was done in 1793 and 1794. Referring to this plan of the starlings, done in 1799, and trying the width of St. Mary's lock between the starling, by the scale, I find the dimension the same as in the recent survey by Mr. Giles.

Examined by Mr. R. Jackson.

Your not having reported upon any part of the starling of the great arch, has been from its not being in want of reparation?—From its not wanting it. There have been small reparations to the planking where injured by craft, but there has been no general repair.

There were some fissures in the soffite of one of the arches; where were they?—In the soffite of the Nonsuch lock, as it is called; the lock or waterway immediately south of the great arch; I have known them for many years precisely in the same situation; but I caused them to be repaired, as that was one of the arches which would not have been removed by the enlargement of the waterway, as proposed in 1814.

Did you repair them from any idea of being dangerous, or as upon the question of sight?—Upon no idea whatever as to danger; but I was aware that they had been the subject of exaggerated statements, and caricature drawings, and that principally induced me to do it before this investigation, in the early part of the last year.

Did they exhibit in that part of the bridge they belonged to, a great antiquity?—They were in the old bridge; you are aware, that the bridge has been enlarged on each side of the old bridge; these fissures were in the old part of the bridge, and I have no doubt, have been in that situation for centuries; they have every appearance of it.

Have the goodness to state in what way you repaired them, whether with masonry or with plaister?—Substantially with masonry.

Examined by the Committee.

Are the fissures of which you now speak, those respecting which Mr. Rennie gave evidence before the Committee, upon the Southwark bridge?—I should think so, as they were certainly the worst; but I am not certain, as there are other fissures in other arches.

Do you remember, that Mr. Rennie stated, that he had poked a boat-hook of seven or eight feet in length into one of those fissures?—I believe he did so state it.

James Mountague, Esq. (26 March.)

I wish to know, whether that is one of the exaggerated statements that called your attention to the repair of that fissure?—Certainly not.

Where were those exaggerated statements exhibited?—They have been exhibited here, in this session of Parliament, and they were shown by drawings in documents in 1799 and 1800, before the Select Committee of this House, on Port of London improvements.

By whom were they exhibited here?—The statement has been made here by the witness whose evidence has been expunged; and the drawings were made by the same person.

Would you not have thought, that the representation by an engineer of Mr. Rennie's character, that there was a fissure of the description I have given, in which he could poke a boat-hook seven or eight feet deep, and from which he apprehended danger to the bridge, and adding, to the best of my recollection, that upon the breaking up of the first severe frost upon the Thames, the bridge must fall, a sufficient ground to call your attention to the repair of it, without any view of the exaggerated statements of other parties?—When I directed the repairs, I had no idea of danger; the fissures, as I before stated, have been there for centuries, in my opinion, and do not affect in that situation the stability of the bridge. That opinion is not merely mine, but (without disparagement to Mr. Rennie, of whom I think highly) it is the opinion of men, equally respectable and eminent in their professions, such as Mr. Dance and the late Mr. Jessop, both of whom, as appears from the evidence upon the table, have stated, that however alarming those fissures may have been at one time, they are of no importance now, connected as they are, and tied together by additions on each side of the present bridge; that is my opinion too.

What is the species of addition on each side of the bridge; is it the starlings?—No; it is the whole stone work on each side of the old bridge, when widened, under the direction of Mr. Dance's father, and the late Sir Robert Taylor.

How could Mr. Rennie see this fissure in that part of the bridge, when so covered. How long have you been surveyor to the bridge?—Only for five years since, as a regular appointment; I succeeded the late Mr. Foulds; but I have known the bridge intimately since the year 1799; I was with Mr. Jessop and Mr. Dance upon their surveys.

Have you any means of knowing, but from report, those fissures sixty years ago? —Certainly not from my own knowledge; but they have all the appearance of great antiquity.

Do you think it a probable thing, that the architects employed to widen London bridge, if fissures had existed at that time, would have left them in that state, and not have secured them by masonry or some art; do not you think it probable, that they would have had to repair them, if they existed in the way you describe?—I think that it is extremely probable that they did nothing with them, attending only to the security of the bridge; they did what they deemed sufficient, by the additions they made on each side of the old bridge.

And do you in your conscience believe, that the fissures did then exist, and that the architects then employed did the work, and repaired it, and at the same time leaving those fissures open?—It is my firm opinion.

Examined by Mr. R. Jackson.

Do you recollect Mr. Rennie upon his evidence saying, that he would not undertake to state, within fifty years, when those fissures took place?—I believe, but I will not be certain, that he did say so.

I believe that you are in the habit, or the officers under you, of taking monthly soundings of the water under the centre arch?—Yes.

Have you any of those tables of soundings about you, so as to explain them to the Committee?—Yes [*the witness producing a table of the soundings alluded to*], this table shows the manner in which they were done for many years past.

These are monthly soundings of the water under the centre arch?—Yes.

I want to know with what view those soundings have been taken, and what appear to be the general results?—The object is this; as that is the arch exposed to the greatest action of the tide, to watch if there be any decrease of depth, because that would of course render the piles less secure; but there has been no decrease, except of a very trifling nature, for several years past.

When you observe any difference in the level, what steps do you take to restore it to its proper level?—We drop in, close at the foot of the piles, large stones, but there have not been any put in for several years, and what have been put in, now remain there, as they have been felt by me in the course of this month.

Appendix, N° 1.

*James Mountague, Esq.* (26 March.)

You remember, I believe, the removing of a shoal from below bridge?—Yes.

That was done by the elder brethren of the Trinity house, under the direction of the Bridge House committee?—No, not exactly so; it was done at the expense of the Bridge House committee; the Trinity ballast lighters assisted in part, but they were paid for what they did; the work was done on my suggestion, and under my direction.

That shoal was removed to as great a degree as the navigation required?—In my opinion it was.

What depth of water did you leave at low water?—From three to four feet at low water, that low water being reckoned when the tide had ebbed ten feet below the South starling of the great arch, at the East point thereof, which is a very low ebb.

Had you any means of forming an opinion as to the length of time that that shoal had existed in that place, before its removal was thus attempted?—Not from my own soundings; but I recommended the measure to the committee, owing to the representations that had been made to me, and in one or two cases to the committee, that barges in coming through the great arch at an improper time of tide, had occasionally struck upon this bank; I ascertained, by inquiries of those who had been almost daily upon the spot for thirty years, whether to their knowledge or belief, there had been any increase of height upon this shoal, apparent to the eye, because it did, before I began to lower it, occasionally ebb dry at low water. I was informed that there had been no visible increase in that period. I therefore recommended to the committee, that it should be lowered, so as to reduce it as I have before stated, in order that the barges might not be subject to that inconvenience, even although they did attempt to pass at an improper time of tide.

That evil was accordingly remedied?—Yes, at the expense of about 1,600*l.* to the city. It ebbed dry on the first day I began the operation, but never since.

I wish to know whether you removed any part of that shoal, so as to occasion the escape of chalk and rubble; or whether, according to the traditions of your office, that has not existed for ages?—According to tradition, it has existed for a long period; it was formed, I have no doubt, originally, from materials thrown in at the bridge to secure the feet of the piles of the starlings, but chalk is never thrown into the bed of the river; and in the excavations, or deepening over the shoal, we found very little chalk, scarcely any.

In the removal of this shoal you found very little chalk?—Very little; a casual lump, or a little more.

I wish to ask your opinion, as to the bed of the river having filled up to a great degree; is it not the nature of all tidal rivers, as far as your experience goes, occasionally to fluctuate and shift the depth of their beds?—Certainly it is so, and it has been so upon this shoal I speak of; it has deepened in several parts considerably, and without any apparent cause.

Have you then any reason to believe, that there has been a general filling up to the extent of a foot or two, within these few years?—Not generally, or never to the extent stated; I have no idea that it is so. If it were so, I think, as surveyor to the port of London, and having the direction of all the mooring chains of the river for the committee, I must have known it; I should have had representations from the harbour masters of the want of water, or from the superintendent of the mooring chains, with whom I am in communication two or three times a week, and I never heard such a statement,

Then it is not your belief nor opinion, that such is the fact?—Not that a general shoaling has taken place throughout the river; but partial ones there are, I have no doubt. I have lived for fourteen or fifteen years at a place where there is a shoal before my house, which has never altered in my time.

In the case of the partial shoalings spoken of, would you impute them to the nature of tidal rivers, or to the obstruction occasioned by London bridge?—To the nature of tidal rivers, and not to London bridge. The deepest shoaling, stated to have been four feet, I attribute to the circumstance of a mooring stone having been laid there, and covered with ballast.

*Mr. John Kitching,*

Called; (Examined by Mr. Randle Jackson.)

*Mr. John Kitching.*

You have been, I believe, the tide carpenter to the Bridge House committee for the last thirty-two years?—Yes, I have.

Describe

Appendix, N° 1.

Mr. *John Kitching.* (26 March.)

Describe to the Committee the nature of your duty; I wish to know whether, in the discharge of your duty, you are obliged almost daily to observe and superintend the starlings and the waterway of London bridge?—Except on Sundays, I am, daily.

State to the Committee then the general state of the starlings?—I believe the starlings in general are in very good repair, except the chapel head starling, and some of the starlings occupied by the water works.

Is it your duty, and do you so discharge it, to have repairs made to these starlings as often as is necessary?—As often as is necessary; and if any thing is wanted to be done, I do not do it out of my own head, but give notice to the surveyor.

Except the chapel lock, do you believe the starlings to be in as sound a state as you ever knew or heard of their being?—I never knew of their being so well as at present.

What is the state of the chapel lock starling?—I still think that nothing need be done, but to keep it as it is, till this Committee has decided whether there should be another great arch there, in consequence of which the starling would be taken away.

Not to repair the chapel lock till this Committee have determined what plan should take place?—Yes.

Is it now as it is in a state of perfect safety?—Yes, of perfect safety.

Examined by the Committee.

What is in perfect safety?—The chapel pier; the pier of the chapel lock; there was originally a chapel there, at the pier; it stood upon piles, the same as the piers of the bridge; there is the foundation of it now, the stone work at the bottom.

Examined by Mr. R. Jackson.

You stated at the last meeting, in answer to a question put to you by one of the petitioners, the degree of settlement in the centre arch; you have no reason to alter your statement in that respect now, have you?—None whatever; I tried it in March 1820 and March 1821, and I find no change whatever.

During all the number of years that you have known the bridge, have you observed any change in that depression?—None whatever; I have observed it ever since I have belonged to the bridge, and there is not the least deviation whatever.

As the carpenter, you have seen enough of the operation of striking of centres to judge of the matter; to what do you impute that original depression?—I should impute it to taking place at the time the centre was struck.

This is a depression of from one and a half inches on one side to two and a half inches?—On the east side it is an inch and a quarter, and on the west side I think it is two inches and three quarters, in the block cornice of the great arch.

Would that degree of settlement appear much to you, as an artist, in this way, to have taken place upon a line of eighty-five feet, on striking the centre of an arch whose span is upwards of seventy?—No, I do not think it is.

In what mode do you keep these starlings up; do you supply them with chalk?—When we find any diminution; as the wash of water will waste it a little, and in the course of years it will want filling up at the top a little.

In the course of several years past have you had occasion to use much?—On the South side of St. Mary's lock the piles had got so shook, that we could not fasten the upper works to them, and had occasion to draw many piles; and although the timbers were good, and many feet in the ground, yet we could not fasten our upper works to them; there was a waste of chalk which has caused us to have more chalk lately than many years ago.

Except St. Mary's lock, have the others required much accession of chalk?—No, very little. I beg leave to add, that as to those piles we drew, we drove new ones in their places, and not into the lock as has been represented, to narrow the waterway.

Is St. Mary's lock that which one of the petitioners described as having been lately repaired, and in a better way than ever?—Yes, it is.

As to St. Mary's lock, I ask you if it were opened for the purposes of repair; or if the frost either last winter or the winter before tore any part of it away?—There was nothing of it taken away by the frost whatever, neither chalk nor timber, nor any thing else.

Then if the Committee have been so informed, that is wholly incorrect?—The chalk that was wasted was in the place that was opened for repair; and it was taken away by ourselves, and got out of the starling into the lock when we drew the piles.

That is almost entirely repaired?—Yes, very nearly done.

And as to the chapel lock, you have purposely deferred the repair of it?—In consequence of the state it was in.

Is

Appendix, N° 1.

*Mr. John Kitching.* (26 March.)

Is there any other starling not in a state of sound repair except that, at this moment?—There is one that wants a little repair, at the East point of the South side of the sixteenth lock.

Are all the others in good repair?—Yes, very good.

Are you in the course of soundly and sufficiently repairing that that you speak of?—Yes.

When you uncovered St. Mary's lock in this way, for the purpose of repair, you had some opportunity of seeing the inner piles?—Yes.

In what state did you find those inner piles?—Very good and very sound.

Were those inner piles at a comparative space down, or the inmost?—The foundation piles themselves of the pier.

In what situation did you find the foundation piles?—The piles we saw were very good, but those were of sixty years ago, when it was widened.

They would last for ages under water, would they?—Yes.

Examined by the Committee.

Did you see any of the original piles?—Not at that time.

At any time?—Yes.

How many boat-loads of chalk or stones have been put into the river, to protect the starlings since January last?—There has been no stone at all put in; we have had three freights of chalk put into the starling, about fifty-one tons each; there were two of them put into the South and North side of St. Mary's lock, and another into the fifth and sixth; we had but three freights.

Altogether, how many tons?—One hundred and fifty-three tons.

You got to some of the original old piles that supported the piers?—Yes.

In what state were they?—They were a little soft outside, and but little decayed inside, to half an inch.

Do you speak of any particular pier?—That was the case in regard to two or three; they were generally in the same state, very good.

What is the diameter of those piles you speak of?—Some of them twenty inches diameter.

What was the diameter of the smallest?—Fourteen or fifteen inches.

And there was just half an inch of each pile that had become soft from the action of the water upon it?—Yes.

They were completely under water?—Yes.

Always?—Not always.

Are those original piles not always under water?—No; they are above low water mark.

Those supporting the bridge?—Yes, they are above low water mark; they are kept from the air and wash of the water by the chalk and the matter that is put into the starlings.

Do the piles which are completely under water decay in the same manner to about half an inch?—Yes, I fancy they do.

Examined by Mr. R. Jackson.

These are guarded from the air by the starlings being cased and filled up with chalk?—Yes.

Examined by the Committee.

Do you conceive that that keeps them completely from the air?—I cannot say exactly that it is an exclusion of all air.

Examined by Mr. Jackson.

The starlings that required repairs in the centre arch, do they require much chalk?—I have not put any for many years; it has not escaped in any degree.

Have you observed any thing respecting the bridge, which indicates approaching danger?—None whatever, in my opinion.

From your daily habits of attendance and watchfulness, would it be apparent to you, if it were the fact?—I should certainly have noticed it.

Are you the person who make the monthly soundings yourself?—Yes, I am.

Do you upon the whole believe the bridge to be in as sound and secure a state as at any period you have remarked it?—I do believe it is.

And for thirty-two years you have been intimately acquainted with it?—Yes, and better.

Had you opportunities of observing it much before then?—Not much.

But you, as the carpenter of the works, and daily upon the spot, are of opinion that the bridge is in as sound a state now as for thirty-two years back?—The starlings are better, and the bridge as good, in my opinion.

Appendix, N° 1.

Mr. James Kelly. (26 March.)

### *Mr. James Kelly,*

Called; (Examined by Mr. R. Jackson.)

You are a lighterman?—Yes.

I believe residing near the Thames?—Yes.

How long have you been in the constant habit of observing the passage through London bridge?—For forty years, or a little more.

Are you still in the habit of passing down it?—I am, constantly.

How many times a week do you mean?—Up and down three or four times a day.

And that you have been more or less for forty years?—Yes.

In the night as well as the day?—Yes; in the night as well as the day.

To pilot the Maidstone barges through the Pool?—Yes; many years ago.

Examined by the Committee.

Was you professionally a pilot?—No; only from practice as a lighterman.

Examined by Mr. R. Jackson.

Have you had occasion to conduct cargoes of considerable value through the bridges?—Yes.

Consisting of what?—Of sugar, and all description of cargoes.

During forty years, state how many accidents you have had in your experience? —Never but one.

Describe what sort of accident that was?—It was a boat called a skiff going through the centre arch, it was fastened to the stern of a lug boat, and the skiff was upset, and a cask was lost.

What occasioned the boat to upset?—The cask rolled; it was a cask of ironmongery; there were two butts of bottled porter which were saved.

Was you in the skiff at the time?—I was in the lug boat at the time.

If you had been in the skiff you would have saved it?—I should have gone through another arch.

Although you have thus escaped yourself, you have witnessed accidents?—Yes, I have seen a few.

In your opinion, what caused those accidents you have seen?—From people being inexperienced, and from inattention.

State some of the accidents you have seen?—I saw a barge, I believe belonging to Messrs. Davy and Sawyer. I was at the Custom House road; the barge was going up loaded with coals, with her head to the southward; the man in her could not get her head up time enough to make the centre arch, but he attempted to make the dry lock, and not being a qualified and practical man, he went direct athwart and he sunk there.

Examined by the Committee.

How do you know that he was not a practical man?—From his action.

Was you upon the river at the time?—Yes.

In what barge?—I was on board a ship at the Custom House road. From the man's method, I do say that he was not a practical man.

Describe that?—The barge's head was under the side of the Battle bridge stair; the man laid the barge's head up, with a view of making the centre arch, and he imprudently did not put the barge's head the other way, which he ought to have done, and then he could have made the main arch, but he rowed for the small arch, which he thought he could go through, but he went directly athwart the two piers, and the barge was knocked all to pieces.

Do you know, that if he could have conducted the barge properly, she might have gone through the main arch?—Yes.

Was there any number of barges at the time in the way to interrupt?—I saw none.

You say he had put her head upwards?—Yes.

Do you mean that he should have laid her head downwards?—Yes.

Speaking of the river?—Yes.

Then she has to go with her stern foremost?—No; the barge should have been wound round the other way; the body of ships breaking the eddy, of course this barge had hold of that eddy, and he attempted to get to the main arch, but it was too strong to do it.

You mean towards the East?—Yes, if he had done so, he would have got in.

It would have made the whole tour round?—Yes.

The eddy would have done that?—Yes.

When did this accident happen?—I believe it was within this twelvemonth.

When was it; do you know what time of the year it was?—No, I do not recollect.

How was the weather then?—A little wind, North-east.

Are you in the habit of bringing up coal barges?—Yes.

You are acquainted with that general work?—Yes, general work of all kinds.

Examined by Mr. R. Jackson.

I believe a great proportion of the craft that goes through the bridge are coal craft?—Yes, they are.

They have some rule by which they ought to govern themselves, made by the Watermen's company?—Yes.

State what rule that is?—All craft that come as far as Traitor's bridge, shall be put under way; that is to say, at their oars, so as to keep in the line, not to strike flat against the bridge; that is the law of the Watermen's company.

According to your daily observation, do these coal craft conform to that law and regulation, or do they not?—They do not.

State how they do proceed?—They very often drive with the tide, and do not make use of their oars.

Examined by the Committee.

In that case they are generally short-handed; are they?—No; there is one man in each barge.

Examined by Mr. R. Jackson.

Do they drift and collect together?—Yes, they do.

Does that expose them to accidents in going through the bridge?—It is very often the case.

And you think they would go through, generally speaking, without accident, if they obeyed the rules of the Watermen's company?—Yes, certainly, there would not be so many.

Under the influence of high winds and currents, you require more strength on board?—Yes, generally.

With such proofs as to high winds and currents, would you have advisedly had less than two men on board?—No.

And would the same assistance be required, in case of floating ice being in the river?—Yes, the same assistance, or more sometimes.

About what tonnage are you speaking of, when you say that two men would be required to navigate?—One man navigates a barge of from twenty to forty tons.

Would one man be enough during high winds and currents?—Not enough, there would be a risque.

Would not a degree of strength be equally necessary to navigate through the Pool as through the bridge?—In high winds very probably; in high winds particularly, when it is in to the Northward.

During winds and currents, such as you have described, do barges frequently trust to one man?—Very often.

Among the accidents that you have observed, have you imputed any of those accidents to want of strength on board?—It may have happened.

Have you seen those accidents?—If this man, who had sunk the coal barge, had had another man with him, it would not have happened; he wanted more strength.

Do you think therefore, that there is danger in going at such seasons and periods without more men?—There is danger.

You have had many opportunities of seeing accidents happening; have you any idea or opportunity of knowing what amount of property may have been lost, owing to those accidents?—Not to a great amount; that barge had thirty chaldrons of coals on board.

Lost by the accident, you mean, of the barge sinking?—Yes.

Have you seen any instances within the last twelvemonth, during which time you have been as often through the bridge as at any preceding period?—Yes, I have.

How many barges have you known sink during the last twelvemonth?—There was one coal barge of Mr. Tash sunk.

Did you see it?—No.

Do

Appendix,
N° 1.

*Mr. James Kelly.*
(26 March.)

Do you know the cause of it of your own knowledge?—There was a sloop lying at anchor, so that she got put by.

Do you know of any other instance of a barge sinking during the last year?—No.

How many lives have you known lost during the last year?—I do not know of any.

Have you known of many for some years past?—Not of late years; I have not known many.

For how many years do you speak of?—There was one lost, I believe, within this last twelvemonth.

Have you any knowledge of the fact yourself?—I was informed of it.

During the year before?—I do not recollect one.

The year before that?—I do not recollect many lives being lost latterly.

Do you recollect any during the third year from this time?—No.

Examined by the Committee.

Are there any accidents that happen from the shipping, to those barges coming up in those high winds and currents you allude to; are there accidents in the narrow part of the Pool to barges from the shipping?—Yes.

They do run foul of the shipping occasionally?—Sometimes they cannot help themselves.

Has there been any barge sunk during your recollection by that means?—Not latterly.

During all your knowledge of the river there has been no instance of a barge sinking in the Pool?—Yes; I have not seen one, but I only know from hearsay.

You cannot speak positively yourself of any wreck?—No, I cannot.

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## *Lunæ, 2° die Aprilis,* 1821.

## WILLIAM WILLIAMS, ESQUIRE,
### IN THE CHAIR.

*Mr. James Grant,*
Called; (Examined by Mr. R. Jackson.)

*Mr. James Grant.*
(2 April.)

YOU are a master lighterman?—Yes.

Living in Old Fish-street?—At No. 6, Old Fish-street.

You are also an owner of craft yourself, a master, in fact?—Yes.

About how many craft are you the owner of?—Twenty-one or twenty-two; I am in partnership with another; I am a part owner.

How long have you been in the habit of navigating the river through London bridge?—About twenty-six years, as well as I can guess.

Has your practice of going through been frequent, or casual?—Frequent; both during the night and day; at all times of tide, and at all times of night and day, as the business requires it.

Has this generally happened to you, in the course of the week, for instance?—Yes; several times in the course of the week, and of the day too.

Have the cargoes which you have undertaken to navigate been pretty valuable?—Yes; consisting of iron, copper, tin, and lead.

About what tonnage do they generally run?—Our craft runs from sixty down to ten tons.

With those heavy craft you require more skill and attention than with the lighter craft, I take it for granted?—Certainly; they require more strength to be in them than the small craft.

Are you also in the habit of navigating a skiff?—Yes.

To the same degree; as often?—Yes; we always take the skiff when we go to fetch the craft.

You are in the habit of navigating with the skiff, as well as with the barge?—Yes.

Now, during these twenty-six years that you have described yourself as going through London bridge at all hours and times of the tide, night and day, did I understand you rightly, to say that you are in the habit of navigating with barges through London bridge at all times of the tides, and night and day?—Not at all times with barges going there; but going down at all times to get the barges, either with a barge or with a skiff; that is the distinction.

Appendix, N° 1.

*Mr. James Grant.* (2 April.)

During this period of years, have you yourself met with any serious accidents?—No.

Have you seen accidents happen to other craft?—I have seen accidents happen to other craft, getting upon the starlings of the bridge.

To what have you imputed those accidents in your mind, when you have seen them?—I have seen accidents very often happen at the bridge through carelessness; and, I believe, most of the accidents happen through carelessness.

State the kind of carelessness that you mean?—I mean when the craft are coming up at different times, when coal lightermen are in the habit of occupying craft, they drive upon their oars, and do not give themselves proper time to get their craft under weigh to get under the bridge; I mean loaded craft coming up.

Do you know of any law of the Watermen's company, as to coal craft, directing at what places or periods they should get under weigh and use their oars?—I have heard talk of it, but I do not know it.

The coal craft are going in great number through the bridge, I believe?—Yes, they do.

And of course are more exposed to accidents?—No, not more exposed, if they take the same care as other people do.

State to the Committee in what respect these coal craft do not take the same care as others do?—I thought I had stated it; they drive upon their oars till such time as they get too nigh the bridge, so that they have not time to get their craft under weigh, so as to get under the bridge in a proper manner.

Do you mean, that they do not use their oars so as to give the barge sufficient weigh to be under command?—Yes.

Do you impute to the circumstances which you have now stated, a material part of the accidents which happen?—A great many of them.

In such cases are the coal craft apt to injure other vessels?—Yes, they are.

State in what manner they occasion mischief to other vessels?—For instance, they injure us very much, because our craft, being very deep and heavy, we want weigh for our craft to keep them under command.

What length are your heaviest craft; what is the length of your barges in the iron trade?—I do not know that I can exactly tell you.

About what length?—I do not know; I should think they are not above forty-five feet; but I only guess at it.

You are most familiar with the iron, and other barges of the description you mentioned?—Yes, mostly with the iron, lead, and tin barges.

Have you been delayed yourself lately by a quantity of coal barges collected together?—Yes, last week I was.

How long were you delayed yourself?—I suppose altogether about an hour waiting.

Where were you then?—I had a lighter loaded outside Mill stairs.

Could the coal craft then have got through sooner, if they had gone through regularly?—If they had persevered to go on, they could have got through sooner, but they were all driving together in clusters, as they generally do.

Had they as many hands on board as you have?—They had but one hand in each; they never have more hardly.

When a barge is properly put under weigh, is it likely then to get athwart the piers, or to clear the arch?—When a barge is properly under weigh, you can do any thing with her.

How many hands have you generally in your barges?—Generally two in heavy craft.

At the time you speak of, what was the state of the tide when you were thus delayed?—It might be about two hours before high water.

How many hours could coal craft at that time have continued to pass?—I should think about four hours.

Was there any necessity then for them to collect in such numbers as you describe?—Not unless they chose, especially when they come to follow; there was a leading wind, and they could have gone straight along, without driving in that way.

For how many hours can loaded craft pass through upon an ebb tide?—About two hours; we go through sometimes for three hours, with loaded craft upon an ebb tide.

How

Appendix, N° 1.

*Mr. James Grant.* (2 April.)

How many hours with half loaded craft can you pass through?—We can go through, when there is water to get away with; as long as there is enough water for us to go away from the wharf.

Cannot barges, which are already under weigh, get through the bridge at a period when it would be too late for the same barges to leave the wharf?—It depends in what way those barges are loaded; half loaded barges can go there after the other craft are aground in the wharf.

Is the navigation of the bridge difficult to a person who is tolerably instructed; to navigate the bridge, is it difficult to a young beginner who has been only a year or two to his trade?—No, there is no difficulty in it, so far as I know, unless it be foggy or blowing weather, in which case it requires strength; then it is more difficult than in other weather.

I want to know whether, upon a flood tide, the coal craft can pass through the whole time of that flood tide, and for how many hours?—Coal craft can go all the time the tide flows.

How many hours will that give them?—Sometimes we may have three or four hours, or five hours; it depends upon the wind, as the wind will make an hour's difference sometimes in the tide.

Examined by the Committee.

You stated, that in your opinion there is no difficulty in getting through this bridge; do you mean to say, that there is no greater difficulty in getting through London bridge with a barge, than in getting through Blackfriars or Southwark bridges?—No, there is not.

Does it require more strength or skill?—It may want more skill.

I understand that skill is always necessary to overcome a difficulty; but I ask you whether there be more difficulty in getting a barge through London bridge than Southwark bridge?—No more at all.

Do you mean to state, that there are not more accidents at London bridge than at Southwark bridge?—Not to my knowledge.

Not in your experience as a waterman?—No.

Is there no more difficulty in getting through London bridge, than through Blackfriars bridge?—I do not often go through there.

Do you think that Southwark bridge is a more difficult bridge to pass than Blackfriars bridge?—I think it is not.

I ask you now, whether there be any more difficulty for a barge to be navigated through Southwark bridge than Blackfriars bridge?—No, I should think not.

Have you ever heard of an accident happening at Southwark bridge, or Blackfriars bridge, with coal barges?—There have been some accidents at Southwark bridge.

Mention one?—There was one barge sunk.

Do you know the fact of your own knowledge?—No.

You have seen accidents happening at London bridge within this twelvemonth?—No, I cannot say that I have seen any accident but that of craft going against the bridge.

You have seen a great many accidents at London bridge, as you have stated already; how long ago do you mean?—I have seen it many times at different times, but I cannot say how long ago.

Is it 50 years ago?—I am not so old; I have seen accidents happen within two or three years ago.

But you have seen no accidents within this last twelvemonth?—I think I have.

Do your barges navigate through any other bridge than London bridge?—London and Southwark bridges.

Do you mean to state, that you get no more impeded in getting through London bridge than through Southwark bridge?—Yes, we do.

What do these impediments arise from?—When we want to make a short fetch.

What do you mean by a short fetch?—Coming through the middle arch and fetching short, by not going too far up.

Explain more clearly what you mean by a short fetch?—I mean when we want to get up to the Steel yard, or old Swan-lane, or any way close to the bridge; coming up the river we cannot fetch in at times.

What do you mean by a short fetch, for that is no explanation?—That is the term we give it.

Is this Steel yard you speak of, above or below the bridge?—Above the bridge, and this is going upwards.

Then

Mr. James Grant. (2 April.)

Then your fetch is complete when you get to the Steel yard?—Yes.

What do you do to perform the fetch, because it is complete when you get there?—Strength is used, and likewise we have a warp to run out to stop them.

To stop what?—The craft.

You mean that the tide carries your barge further through the bridge than you would wish?—Yes.

Except from the tide running rapidly through the centre arch of the bridge, you mean to state, that there is no more difficulty in any respect in passing through one bridge, than there is in passing through another?—I find no more difficulty myself.

And the one bridge requires as much skill as the other does?—No.

Then the removal of the London bridge would not, in your opinion, be of any service to the navigation of the river?—No, I do not think it would be of any service, but would be an injury in many instances; I think it would; but there is one thing wanted, and that is that there ought to be navigable arches on each side, for those fetches that are wanted for people doing their business.

But coal barges do not meet with more obstruction at London bridge than at Southwark bridge?—They do meet with obstructions certainly; but the reason that they meet with obstructions is through their own carelessness; a good many do.

Do you believe in your conscience, that the navigators of coal barges are more careless at London bridge than at Southwark bridge?—They are careless at all the bridges.

You say they do not meet with more obstruction at London bridge than at Southwark bridge?—I do not know.

Do you mean to put your credit to the Committee upon such an answer?—I do not take any interest in the bridge.

Do you mean, that you did not find the difficulties that other people experienced?—That is my meaning.

Do you also mean, that in all the answers you have now given to the Committee, they are applicable to your own knowledge and skill in navigation?—Yes.

Are you a proprietor of any barges?—Yes.

Then I ask you, whether you would intrust the care of any of your barges to the persons who have navigated for years other barges upon the river Thames without any accident, to come through London bridge at all times of the tide?—No, I would not.

Then what do you mean, when you state that there is no more difficulty at London bridge than at Southwark bridge; if it require greater skill, that alone implies a difficulty?—But when there are many craft there is only one place to get through.

Then there is no other difficulty than the narrowness of the waterway?—If there were more waterway, certainly the difficulty would not be so great.

You stated, that there were no more impediments at the one than at the others?—There are more arches in the one than the other.

I will ask you again this distinct question; you have stated, that the coal barges go through London bridge?—Yes.

Do they pass in the same way through Southwark bridge as through London bridge?—No.

Why do they not?—Because the one is obliged to follow the other.

Why do they not pass in a cluster through that bridge as they do through London bridge?—Because they are separated by the tide.

You have stated, that the barges come through London bridge in clusters?—No; there must be some mistake altogether.

I will suppose that barges are going down the Thames with a strong wind from the East; in such a time did you ever see that which you call a cluster of barges going through Southwark bridge?—Yes, I have.

When did you see that at Southwark bridge?—When the Easterly winds have been prevailing several times.

Did any accident arise to that cluster of barges going through Southwark bridge, or was there any difficulty in their getting through?—No.

Have you seen a cluster of barges going through London bridge when the wind was in the same direction?—Yes.

Did any accident or difficulty occur to that cluster of barges at London bridge?—Yes.

What is that difficulty?—That they could not all get in through the arch, as they drove all so close.

Does not that circumstance make them very liable to accidents?—Certainly.

In

Mr. James Grant. (2 April.)

In coming with the wind, when they are going up the Thames, do the barges very frequently then get into clusters at London bridge?—Before they get to the bridge.

Does that cause any difficulty to the barges getting through the bridge?—It does cause a difficulty, because they do not get their craft under weigh in time to get under the bridge. There is a vast deal of difference between the loaded and the light craft going through the bridge with that wind.

Are not loaded craft in such a situation likely to meet with accidents at London bridge?—At times, certainly.

Are they equally liable to be in that situation at Southwark bridge?—I do not know; I do not think they are, as there is more room to get through.

I ask you again, after that question, whether you think if London bridge were removed, and a bridge of a different construction built, it would benefit the navigation of the river; if, for instance, a bridge similar to Blackfriars bridge were to be built in the same situation, would it improve the navigation of the river?—It would give more room to the craft going up and down.

Does not the narrowness of the present waterway at London bridge occasion a very rapid tide to go through the centre arches?—Certainly.

Is that a benefit or a detriment to the navigation of the river?—It cannot be a benefit.

Do you consider it as being detrimental to the navigation of the river?—Yes, I should think it would be so.

Is it possible for light barges to go through London bridge against the tide?—No.

They can go through Blackfriars bridge against the tide?—What sort of craft do you mean?

I mean any sort of craft?—I never saw any go through against the tide; but they can go through by hauling.

Are there no sailing craft on the river Thames that pass through?—Yes.

Do you mean your answers to apply to your own craft that you use?—Certainly, I mean that.

I was not speaking of those vessels; I was speaking of craft in general, smaller craft?—They can certainly go through, if there be wind; small boats can pass.

I wish to ask you, whether any craft which can be navigated against the tide, meet with any impediment at Blackfriars bridge, to prevent their going through against the tide?—No, certainly not.

Now, as to craft that can be navigated against the tide, can they go through London bridge against the tide?—No.

The navigation of Blackfriars bridge is open at all times of the tides for craft to pass through it, but London bridge is not?—Blackfriars bridge is, but not London bridge; we can only go through London bridge when the tide flows each way.

How many hours each tide can craft pass up and down through London bridge at common tides; I mean loaded craft?—They cannot pass on ebb tides with loaded craft, more than between two and three hours outside; now, upon flood tide, they can pass all the tide.

Do you mean, that as soon as the tide begins to flow at London bridge, craft can pass through it?—No; but as soon as the tide makes up.

How many hours is that?—About four hours.

How many hours at flood tide can you go through London bridge with a loaded barge?—I should suppose about four hours, when there is no wind, with a common tide; sometimes four and a half hours.

Examined by Mr. R. Jackson.

When you said that there was no difficulty in passing the craft through London bridge, do I understand you rightly to say, that you found no difficulty in it?—I never found any difficulty in it.

Did you mean to say, that there was no difficulty in it, if they were navigated by persons of sufficient skill?—Persons of sufficient skill can go through that bridge during all the tide.

When you said, that there was no difficulty in conducting loaded craft through London bridge, do you mean to say, that there was no difficulty at all, or to persons of skill only to come through the bridge?—I do not see any difficulty to persons of skill.

You say that coal barges do not go through Southwark bridge in clusters, as there are three arches instead of one; if there were three arches to London bridge, would the

*Mr. James Grant.* (2 April.)

the difficulty be more than at Southwark and Blackfriars bridges?—No, I do not think it would.

Would your craft get through without being driven in clusters?—I think they would.

*Mr. William Waller,*

Called; (Examined by Mr. R. Jackson.)

*Mr. William Waller.*

You are a lighterman?—Yes.

A master lighterman?—Yes.

Living in Bermondsey?—Yes.

How long have you been acquainted with the navigation of the river Thames, through London bridge?—About thirty-eight years, from the time I first became an apprentice.

During that time has your business led you to pass with loaded craft through London bridge?—Yes, it has, for twenty years; I have been for twenty years passing backwards and forwards through the bridge.

Was it many times a week, or a day; was it very frequently?—Sometimes four or five times a week, and sometimes two or three times a day.

At different periods of the tide I presume?—Yes.

Have you been in the habit, during that period, of conducting heavy and valuable cargoes?—Iron work; I have dealt in iron work for ten years; from twenty tons to seventy tons, and upwards.

Is there any particular mystery in conducting craft through London bridge, or might a man of tolerable skill and care conduct them?—Certainly; I see no difficulty to a man who knows his business. There is a very great draught under London bridge into the centre arch.

During these thirty-eight years, have you yourself experienced any accidents?—Yes, I have seen different craft athwart the bridge.

Have you met with any yourself?—No, not myself; I never met with an accident going through in my life, and I have gone through to the Old Swan with indigo, and all kinds of dye stuffs in lug boats.

You have been in the habit of going through both by night and by day?—Yes, with all sorts of craft with logwood.

You yourself never experienced any accident yet?—No.

But you have seen accidents happen to other craft?—Yes.

Explain to the Committee, what in your opinion those accidents, generally speaking, are owing to?—A great deal of it is owing to coal craft being loaded at low water, and then they come up all together, as soon as the tide begins to make up; they all come driving away together.

By driving, you mean before they take to their oars?—Yes.

Do you know any rule of the Watermen's company, with respect to the periods of their getting under weigh?—I do not know of myself, any more than I have heard, that they ought to get under weigh and row a-head, as soon as they get to the Tower stairs; if they were to do that they would get through.

If they were to get under weigh at that place you describe, would it, in your opinion, occasion them to pass with safety?—Certainly it would; if they would do as other lightermen do, and keep them under weigh, they would certainly shoot the bridge; there is no doubt about it.

Is it for want of getting under weigh in due time, that they get into clusters?—Yes, it is.

Near the bridge?—Yes, for want of their rowing their craft, instead of driving with the tide, and keeping them under weigh, it makes them all get together there; as soon as they get near the bridge, the one that is at the head begins to shoot, and then they begin to separate.

What is the consequence to themselves of their thus getting into clusters; do they go through the bridge in a confused or irregular way?—Very much in one another's way; they cannot use their oars.

Do you mean that they, by coming in so crowded a state, want room to use their oars?—They do.

Is their having room to use their oars, essential to their safety in going through the bridge?—Certainly; a man should always keep his craft under weigh, and his oars always in the water; if a man suffer himself to drive with the tide to any part of the river, he is sure to do himself mischief and other people too.

If they got under weigh at the proper time and place, you have described, they would, in that case, follow each other?—Certainly they would; if they were all to keep rowing together, they would all get regularly through the great lock.

Mr. William Waller. (2 April.)

Do you happen to know, whether in times of great frost there is a great degree of eagerness for one to get before the other of the coal craft, in order to arrive the soonest at the wharf?—I never took notice of any; for where you see one coal lighterman rowing, you will see dozens driving with the tide.

Examined by the Committee.

As to this circumstance which you state, of their getting into clusters together up to London bridge, and that being inconvenient, does not that inconvenience arise from the narrowness of the waterway, and from their being driven through one arch of London bridge?—Yes.

If London bridge were constructed in the same way as Southwark bridge is constructed, would there be any occasion for those regulations, or any inconvenience experienced by the craft?—Certainly, the more room they would have to go through.

What is the length and draught of water of one of your loaded barges in the iron trade, the largest sort you have in your trade, what is the draught of her when loaded?—I should suppose eight feet draught, or rather more, when loaded.

What length are they?—I suppose a lighter of between seventy and eighty tons, would be nearly forty feet.

What do you mean by a lug boat?—A boat that will carry from five to ten ton.

Are you of opinion, that the present construction of London bridge is detrimental to the navigation of the river?—If there were two more locks it would be beneficial; it certainly is detrimental; by the way those people act many men meet with accidents.

Are there as many accidents happen at Blackfriars bridge, as at London bridge?—Certainly not.

Then the accidents have been owing to the construction of London bridge?—Yes.

Do not people do exactly the same thing at Blackfriars bridge and Southwark bridge, as at London bridge?—Certainly; when they go through London bridge the tide goes so rapidly through the arch that it separates them, but if they had the same space as at the other bridges, they would go in the same way up.

That is the cause of the great inconvenience, the rapidity of the tide through the arch?—Yes.

And that is occasioned by the extension of the starlings; do they not narrow the waterway, and occasion the craft that inconvenience?—Certainly.

Have you ever seen any accidents arising to craft coming down the river?—Yes.

To what do you ascribe them?—I cannot tell what it may be owing to; but if people do not take any pains, they may go against every bridge in the river.

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*Martis,* 3° *die Aprilis,* 1821.

## MR. ALDERMAN WOOD,

IN THE CHAIR.

*Robert Finch Newman, Esq.*

Comptroller of the Bridge House estates, Called.

R. F. Newman, Esq. (3 April.)

[This witness delivered, in pursuance of the order of the Committee of the last meeting, a document, intituled,

"Copy of the Proceedings of the Bridge House Committee, in relation to the Treaty with the Manager of the London Bridge Water Works, and the Directors of the New River Company, for the purchase of the Interest of the Proprietors of the Water Works in those Works, together with Copies of the several Documents referred to in such Proceedings."

This document was read by the clerk to the Committee.]

Examined by the Committee.

What is the total amount of what has been considered as the sum to be paid by the New River company, to the London bridge company?—The New River company

Appendix, N° 1.

*R. F. Newman, Esq.*

(3 April.)

company have proposed to secure to the proprietors of the London bridge water works 2½ per cent per annum on the amount of their shares.

What have they offered as a compensation to servants?—They have made no offer on that account.

Then the New River company decline giving compensation to any servants?—Yes; but it will appear by the documents I have delivered in, that they have considered the sum of 7,500 *l.* as a fair compensation for the officers. I should observe, that the New River company have not inquired into the nature of the different offices, or the length of time that the officers have been employed.

In the negociations which have gone on, have the New River company offered to guarantee the 2½ per cent out of their capital which they possess?—It appears by the documents I have delivered in, that they offered to secure to the proprietors of the London bridge water works 2½ per cent,

How is that to be secured?—That has not been stated.

Is it your opinion, that they mean to grant from their property the security of the 2½ per cent?—Yes.

Be kind enough to explain to the Committee what are called the Bridge House estates, how they came into the possession of the city of London, and for what purposes they were granted to them, or otherwise obtained?—A description of the property is annually laid before the Bridge House committee at their first meeting, sufficient to meet the question.

Explanatory of the nature of the original grant?—It states how the estates came to the city generally.

And for what purpose they were granted?—Yes.

How are the Bridge House estates administered?—By a committee of the corporation, composed of a member from each ward, and a certain number of aldermen.

A common council man of each ward?—Yes.

What officers are employed by that committee?—There are two bridge masters, a comptroller, a clerk of the works, an assistant clerk at the Bridge House, a superintendent of the works at the bridge, a bridge carpenter, a messenger, and collector of rents from tenants at will in St. George's fields.

What are the duties of the two bridge masters, and what salaries or emoluments attach to their office?—The duties of the bridge masters are to receive and pay all sums of money upon the Bridge House account.

That is they are stewards of the estates?—They are rather to be called cashiers and accomptants.

They receive the rents of the estates, do they not?—Yes, they do.

And disburse the proceeds under the orders of the committee, I suppose;—Yes.

And the salaries are 250 *l.* each?—The salary of the senior bridge master is 250 *l.* and that of the junior bridge master is 200 *l.*

What are the duties of the comptroller's office?—He attends all the committees, keeps their journals, prepares their reports to the common council, and all other documents and leases.

Is he a professional man?—Yes; he has the custody of title deeds, and conducts all the law business relating to the Bridge House estates.

What is the salary attached to that office?—Three hundred pounds a-year.

Are there any other emoluments attached to it?—There are.

Explain the nature of them?—The comptroller has been entitled to a house, but he has now a compensation of 95 *l.* a-year in lieu of a house; his emoluments as solicitor are of course variable; he is paid for the business he does. He has coals allowed him, which, with the compensation for the house, amount together to about 120 *l.*

Can you state the emoluments, *communibus annis*, as solicitor?—The average, including what may be received from the tenants for preparing leases, under-leases, assignments, &c. is about 330 *l.* a year.

What are the duties of the clerk of the works?—The duties are the general business of a surveyor.

An architectural surveyor?—Yes.

Is any salary attached to it, and what?—Five hundred pounds a-year.

Are there any other emoluments?—None.

What is the office of the assistant clerk to the Bridge House?—He is an assistant to the bridge masters.

What are his duties?—His duties are to keep the books.

Relative to repairs?—Relative to receipts and payments; he is assistant to the bridge masters, and keeps the accounts, but under the controul of the corporation, and not the bridge masters.

What salary is attached to his office?—Two hundred pounds a-year.

Are there any other emoluments?—He has the upper part of the Bridge House to reside in, with an allowance of coals and candles.

What would you estimate those at?—I should think about one hundred pounds per annum, including the house.

What are the duties of the superintendent of the works at the bridge?—Generally to superintend all the repairs that are necessary to the bridge.

Who is that gentleman?—Mr. James Mountague.

What is the salary attached to his office?—One hundred pounds a-year.

Has he any other emoluments?—No.

Has he no per centage upon the repairs done?—No.

No coals nor candles?—No.

What are the duties of the carpenter to the bridge?—He is the foreman of the works at the bridge.

What is his salary?—Two hundred pounds a-year, with a house to reside in.

Of what value?—About forty pounds a-year.

With coals and candles?—No.

What are the duties of the messenger?—To summon the committees, and deliver notices to the tenants, and letters on the business of the Bridge House.

What salary?—Thirty-six shillings per week.

Has he any other advantage?—The messenger has hitherto had a house to reside in; but as that office, together with the office of collector of rents of tenants at will in St. George's fields, is in the same person, he now resides in a house in St. George's fields, provided for him as the collector.

A house belonging to the estates?—Yes.

What is that worth?—About forty pounds per annum, I should suppose.

Has he any per centage upon the rents he collects?—Five per cent.

What does that amount to?—Upon an average about two hundred and fifty pounds hitherto.

That would be upon a levy of five thousand pounds?—Yes.

Are those all the offices?—Yes.

Are there any other emoluments attached to the bridge masters?—The senior has a house to reside in.

What may that be worth?—About eighty-six pounds a year.

And the junior has nothing?—He has an allowance in lieu of a house.

How much?—Sixty pounds for house rent, and twenty-six pounds for taxes.

What are the other little emoluments?—A fee upon receipts for rents of four-pence per quarter, called an acquittance, which amounts to about ten pounds a-year, and fees upon leases, under-leases, and assignments, amounting to about fourteen pounds per annum.

For the two?—Each.

What is the meaning of the item, in the printed Brief Statement of the Accounts for the year 1819, called "Proper Rents?"—The rental is divided into different heads, and has been so for centuries; the same headings are now kept up; the original meaning of them I am unable to state; but I rather conceive, that "proper rents" meant rents within the city of London and borough of Southwark, and "foreign rents" those without the city.

Then proper rents are the rents of premises situated within the city of London and borough of Southwark?—Yes.

Do those terms, in point of fact, apply to them, and include all rents of premises situated in London?—Not now; they are mixed, and some estates not in the city are under the head of "proper rents."

Then there is no just distinction between "proper rents" and "foreign rents?"—No; they are mixed; I conceive that was the distinction, but I have not been able with certainty to understand it.

Do you know of any period when that was the case, when "proper rents" included only those within the city and borough?—Yes; that was the case, in point of fact, although that has not been kept up in modern days.

Then the "proper rents" and "foreign rents" put together, constitute the whole rental of the Bridge House estates?—No; there are two other heads, namely, "lands purchased," and "quit rents."

What is meant by "lands purchased?"—They were lands purchased of one of the former kings, and were entered under a distinct head.

Appendix, N° 1.

*R. F. Newman, Esq.* (3 April.)

They were lands purchased a considerable period ago, out of the money arising from the Bridge House estates?—I think so.

And appropriated to the same purposes?—Yes.

In looking back to the rental of three years, 1817, 1818, and 1819, I find the rental under the items "Proper Rents," Foreign Rents," and "Lands purchased," to vary considerably; for instance, they are higher in 1817 and 1819 than in 1818; from what does that difference arise?—You are not looking at the rental now, but the monies received on account of rent; more rents may be received in one year than another.

Can you inform the Committee, what is the actual rental of all the Bridge House estates for the last year?—The rental of the Bridge House estates for the last year is 25,805*l.* 13*s.* 2*d.*; that is the gross rental of the lands for 1820.

What was it in 1819?—It was 23,990*l.* 5*s.* 1*d.*

What sums have been accumulated from the surplusses of these rents beyond what were required for the repairs of the bridge?—There has been already a return made to this Committee, which I believe will answer that question.

Cannot you answer it otherwise, as it would be better to have it in evidence?—On the 31st of December last, there were 50,000*l.* 4 per cent. consols; 30,117*l.* 14*s.* 3 per cent. consols; 44,496*l.* 7*s.* 9*d.* in cash, exchequer bills, and money lent.

What does "money lent," mean; to whom lent?—To the corporation of London.

State what is the portion in cash, what portion in exchequer bills, and what in money lent; and to whom?—The sum of 7,313*l.* 3*s.* 3*d.* in cash, part in the hands of the chamberlain, part in the hands of the bridge masters, and part with the accomptant-general of the court of chancery.

For what purpose?—It is the proceeds of some freehold property in St. George's fields, sold under an act of Parliament, to be re-invested in the purchase of freehold property.

What in exchequer bills?—800*l.* in exchequer bills, and 36,383*l.* 4*s.* 6*d.* money lent.

To whom?—To the city of London.

Is there any loan to the city of London of stock?—Yes.

What?—9,000*l.* 3 per cent. consols.

Part of the 30,117*l.*?—Yes; part of the 30,117*l.* 14*s.*

Any thing else?—Nothing else.

What do you make out to be the rent of lands last year?—25,805*l.* 13*s.* 2*d.*

What is the meaning of the item in the expenditure of "rents and other charges," amounting to 72*l.*?—They are charges made upon the Bridge House funds by the acts of Parliament for widening the bridge, and rents and other charges payable out of the Bridge House funds.

What acts of Parliament?—The acts of 29th Geo. II, chap. 40, and the 2d of Geo. III, chap. 30.

What is the meaning of the item of "taxes and trophies," amounting to 707*l.* 1*s.* 10*d.*?—It consists of tithes, taxes, poor and paving rates, and a charge made upon the estates by the act of Parliament before mentioned, for the maintenance of poor persons who have gained a settlement upon the bridge.

Can you inform the Committee what is the average annual expenditure in the repairs of the bridge?—That appears in the printed abstract of the proceedings delivered in to the Committee; the average is about 3,500*l.*

What is the nature of the article "necessary expenses," amounting to 1,169*l.* 18*s.* 6*d.*?—The wages of watchmen and others employed upon London bridge and in the bridge yard; and also stationery, receipt stamps, coals, lighting lamps, and other small disbursements and incidents of office.

Now the next article, "masons, carpenters, and others," means the repairs to the bridge; does it?—Not merely to the bridge.

Explain the item, "masons, carpenters, and others," amounting to 3,529*l.* 12*s.*?—It consists of payments made on account of the works at the bridge and at other parts of the estates, such as repairs of the officers houses, the town hall, &c.

Is London bridge lighted with gas?—No.

What are "benevolences?"—Ancient customary payments.

How sanctioned?—By custom.

What is the meaning of the item, "magistracy of the borough," amounting to 3,404*l.* 6*s.*?—A payment made by order of the court of common council, to defray the expenses of the city's magisterial jurisdiction in Southwark.

How long has that been a charge upon the Bridge House estates?—From the year 1815 until the middle of last year.

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*R. F. Newman, Esq.* (3 April.)

Was any establishment of the same nature existing in the borough prior to the year 1815?—Not of the same nature; there has been a city magistrate in the borough of Southwark for a very long period.

Has he been salaried?—I cannot speak prior to the year 1815; I cannot say whether he has been salaried previous to that time or not, but there has been an antient payment made to such magistrate out of the Bridge House funds of 20*l.* a-year.

Can you trace any authority for the payment, even to the extent of 20*l.* a-year, out of the original grants, or any subsequent instruments by which the city hold these estates?—I have never searched.

Can you obtain that information for the Committee?—I can search for it.

What is the earliest period in which you have found an entry of 20*l.* a-year?—I believe between the years 1500 and 1600; nearly as early as the grant of the magisterial jurisdiction of the borough of Southwark to the city of London.

I wish to know by what authority have the committee of the Bridge House estates felt themselves warranted in issuing this sum, for the establishment of the judicature of the borough of Southwark in the year 1815?—By the authority of the court of common council.

Are the Bridge House estates granted to the common council?—Some estates are granted to the mayor, commonalty and citizens of London, others to the wardens of the bridge.

What are the purposes for which the grant is stated to have been made, I mean that grant which you say was made to the mayor and commonalty of the city of London?—There is more than one grant; they are very numerous. The majority of the grants are to the mayor, commonalty and citizens.

Without any object specified?—No; the greater part of them are in trust for the support of London bridge.

Are there any of them that authorize any other application of their proceeds?—There are not any in terms so authorizing it, but there are some generally to the mayor, commonalty and citizens, without declaring any trust.

Do the mayor, commonalty and citizens, consider themselves warranted in applying those you have last described to any purposes other than the sustentation of the bridge?—They have considered themselves so warranted.

Since when?—The year 1815.

To what purpose?—To the purpose of the magistracy of Southwark.

What is the amount of the revenues of those estates?—I cannot state from memory; they consist of the estates in St. George's fields. I can ascertain the exact rental of those estates.

In point of fact, has there been any objection taken to this application of the monies towards the support of the judicature in Southwark?—There has; the objection originated in the Bridge House committee.

What proceedings have taken place in consequence?—The opinions of counsel have been taken, and although those opinions differ, the court of common council have refrained from drawing any further sum from the Bridge House funds on that account.

Have they done no more than refrain from further expenditure; have they reimbursed any portion of what they had so expended?—They have not reimbursed any portion, but they have added a part to the debt owing from them to the Bridge House.

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### *Mercurii, 4° die Aprilis*, 1821.

## MR. ALDERMAN WOOD,

### IN THE CHAIR.

*Robert Finch Newman, Esq.*

Called; and delivered, in pursuance of the order of the Committee, the following Paper, which was read:

*R. F. Newman, Esq.* (4 April.)

> "A brief Statement of the real and personal Estate of the Bridge House, and the annual Rents and Produce thereof, on the 31st day of December 1820; and of the general Tenure of the real Estates.

"THE real estates consist of houses and other buildings, and land, situate in the several parishes of St. George, St. Saviour's, and St. Olave, in Southwark; and Mary Magdalen, Bermondsey; St. Olave, St. Magnus, St. Bennett's, Gracechurch-street;

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*R. F. Newman, Esq.* (4 April.)

Mary Magdalen, Old Fish-street; St. Faith; St. Michael-le-Quern; Christ Church Allhallows, Honey-lane; St. Michael, Wood-street; St. Margaret Moses; Allhallows on the Wall; St. Stephen, Coleman-street; St. Ethelburga; St. Dunstan's in the East; St. Margaret Pattens; St. Mary at Hill; St. Dionis Backchurch; St. Giles Without Cripplegate; Allhallows the Great; St. Mary Woolchurch; St. Botolph Without Aldgate, in the city of London; at Lewisham, Deptford, Rotherhithe and Stratford, and at Horton by Ewell, in Surrey. The greater part of the estates is in lease, some part is in the occupation of tenants at will, some part is used for the purposes of the Bridge House, and other part is at present untenanted.

"The annual rents of such parts as are let, amounted at Christmas last to 25,805*l.* 13*s.* 2*d.*

"The titles to the property are very numerous and antient; it would be extremely difficult to set forth the precise term or trusts upon which every particular estate is held, but they were generally granted or devised by kings of England, and charitable and well-disposed persons, or purchased out of the surplus income arising from the rents, customary tolls, briefs, benefactions, legacies and other donations, and are held by the mayor and commonalty and citizens of this city, upon trust, for the support of London bridge, the words of the trust being almost invariably, "To the use of London bridge," "For the works of London bridge," or "For the support of London bridge;" but in some instances no trust is declared; some parts of the estate are subject to the payment of small annual quit rents, and other parts were, before the Reformation, liable to the expense of performing certain masses and other religious ceremonies, according to the directions of the donors; and the estate at Stratford, consisting of watermills, waterworks, houses and land (which produce a rental of 409*l.* 4*s.* per annum) is liable to the support of two bridges there (called St. Michael's bridge, and Pegs Hole bridge) and a portion of the roads adjoining. Since the year 1784, the sum of 2,467*l.* 8*s.* 11*d.* has been expended in rebuilding and repairing the bridges, and the sum of 50*l.* per annum is paid as a composition for repairing the roads."

The Personal Estate on the 31st day of December last, consisted of the following Particulars:—

| | £. | s. | d. | £. | s. | d. |
|---|---|---|---|---|---|---|
| Four per cent consolidated bank annuities, vested in the names of the chamberlain, town clerk, and comptroller of the bridge-house estates | 50,000 | — | — | | | |
| Producing per annum | - | - | - | 2,000 | — | — |
| Three per cent consolidated bank annuities | 11,257 | 1 | 6 | | | |
| Producing per annum | - | - | - | 337 | 14 | 2 |
| Three per cent consolidated bank annuities, lent to, and to be replaced by the city | 15,000 | — | — | | | |
| Producing per annum | - | - | - | 450 | — | — |
| Cash lent to, and to be replaced by the city | 33,000 | — | — | | | |
| Producing per annum | - | - | - | 1,650 | — | — |
| Cash paid on account of the Borough compter, to be repaid with interest by the city, pursuant to an order of the court of common council, of the 25th day of January 1821 | 3,383 | 4 | 6 | — | | |
| Exchequer bills and cash, in the hands of the accountant general of the court of chancery, to be vested in freehold property | 850 | 17 | 1 | | | |
| Producing per annum, about | - | - | - | 30 | 12 | — |
| Three per cent consolidated bank annuities, standing in the name of the accountant general of the court of chancery, to be vested in freehold property | 3,860 | 12 | 6 | | | |
| Producing per annum | - | - | - | 115 | 16 | 4 |
| Leasehold houses and premises in St. George's fields, producing, after payment of rents, per annum | - | - | - | 113 | 12 | — |
| Cash in the hands of Mr. Chamberlain | 6,157 | 10 | — | — | | |
| Cash in the hands of the bridge-masters | 1,104 | 16 | 2 | — | | |

Summary of the above:

| | £. | s. | d. |
|---|---|---|---|
| Four per cent consols | 50,000 | — | — |
| Three per cent consols | 30,117 | 14 | — |
| Cash, loan to the city, and exchequer bills | 44,496 | 7 | 9 |
| Total Income of the real and personal estate £. | 30,503 | 7 | 8 |

*Note.*—Since the 31st of December last, a sum of £. 4,000 four per cent consols, has been purchased.

Can you state to the Committee what was the cause of the application of the Bridge House estate to the magistracy of the borough?—Upon the petition of the inhabitants of Southwark, for the establishment of an efficient magistracy there, the corporation

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corporation referred it to a committee to inquire, whether the proceeds of certain estates in St. George's fields were applicable to the expenses of such magistracy; the committee acting, as I believe, under the advice of the city law officers, reported to the court of common council, that they were of opinion that those estates were chargeable with such expenses, and in their report they state the nature of the magistracy they recommended should be established; that report was acted upon, and a certain sum of money from that time has been appropriated out of the funds arising from those estates to the expenses of the magistracy, until the year 1820. In the year 1817, the borough compter being very much out of repair, the court of common council referred it to the Bridge House committee, to consider and report on the repairs necessary. Upon representations which were then made to the Bridge House committee, they deemed it proper to inquire into the propriety of applying the proceeds of the estates before-mentioned to such purposes, and ultimately came to an opinion, that such proceeds were not applicable to such purpose, and so reported to the court of common council; before the court of common council came to any opinion upon that report, a report was presented to them by another of their committees, accompanied by the opinion of the city solicitor, Mr. William Lewis Newman, that the proceeds of such estates were strictly chargeable with the general expenses of the magistracy; in consequence of which, the court of common council referred it back to the Bridge House committee, to proceed to carry the repairs of the borough compter into effect; the Bridge House committee still entertaining considerable doubt upon the subject, desired that a case should be prepared for the opinion of counsel; such case was accordingly prepared by the late Bridge House comptroller, Mr. Samuel Newman, on behalf of the Bridge House, and Mr. William Lewis Newman, the city solicitor, on behalf of the city; it comprised every thing that could be found to bear upon the question, from the earliest period down to the time that the case was prepared, with the arguments and observations of the two officers upon the subject.

That is, the solicitor for the city, and the comptroller of the Bridge House estate?—Yes; these cases were laid before five counsel.

Will you have the goodness to name them?—Mr. Recorder, Mr. Common Serjeant, Mr. Bolland, Mr. Serjeant Lens, and Mr. Scarlett; in consequence of these opinions, which were reported, with a recommendation from the Bridge House committee to the court of common council, the court decided, that no further payments on account of the borough compter, or the city's criminal jurisdiction in the borough, should be made by the bridge masters. A great many points involved in remote antiquity are comprised in that case; but the broad ground upon which it was conceived that the estates in question were liable to those expenses are these; first, that the charter, conveying those lands to the city, does not state any trust whatever, but the conveyance is generally to the mayor and commonalty and citizens, not saying a word about the bridge; and, secondly, that the conveyance, *videlicet*, a charter of Edward the Sixth, also imposed upon the corporation the magisterial duties of Southwark; it was therefore contended, that as certain duties and estates were granted to the City by the same charter, the revenue arising from the estates, should specifically defray the expenses incurred in executing the duties.

Was there no earlier charter that granted the jurisdiction of the borough, not as an imposition, but as a favour, than the charter of Edward the Sixth?—The former charter did not grant any magisterial jurisdiction; it gave the corporation powers to follow felons who had committed offences within the city, and sought refuge in Southwark; the first charter is that of Edward the Third; the next charter is Edward the Fourth, which recites the former charter.

[*The opinions of Mr. Recorder, Mr. Common Serjeant, Mr. Bolland, Mr. Serjeant Lens, and Mr. Scarlett, were delivered by witness, in pursuance of the order of the Committee, and read.*—See Appendix, No. 11.]

Do you know what has been the whole amount expended since the year 1814, in defraying the expense of the establishment of the criminal jurisdiction of the borough?—It appears by the account delivered in by order of the House of Commons last session, to be 11,409*l.* 16*s.*

Does that include any sum of money spent in the repairs or in additions to the borough compter prison?—Yes.

Separate those two accounts if you please?—The amount expended in repairs and other works connected with the borough compter is 3,157*l.* 4*s.* 6*d.*; there is another sum of 226*l.* which was paid partly to a person who sustained an injury by the

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the building of the boundary wall, and the remainder to a tenant of the Bridge House, who gave up possession of premises held by him for the purposes of the borough compter.

Then the expense of the magistracy for the borough of Southwark has been 8,026*l.* 11*s.* 6*d.*?—Yes.

Why has the sum of 3,383*l.* 4*s.* 6*d.* only been considered as the debt due from the city on account of what has been expended on account of the magistracy and the repairs and extension of the prison in the borough?—The opinions of counsel have not decided the point itself; it is still a matter of doubt, and I believe the corporation would not have established the magistracy in the year 1814, or at any rate to the extent with respect to the officers, &c. that they did, unless they had considered, as they were then advised, that those particular estates were chargeable with those expenses; it might turn out upon a judicial investigation of the subject, that those estates are chargeable with such expenses; the corporation finding that there was a difference of opinion upon the subject, and that certainly the opinions preponderated in favour of the Bridge House, determined to draw no further on that fund; but for the reasons I have stated, they have not thought that they ought to be called upon to reimburse the expenses which have been hitherto incurred, with the exception of that part which was incurred in repairing and enlarging the compter.

With so decided a preponderance of the opinions of four counsel out of five, in favour of the Bridge House estates, and so doubtful an opinion entertained by the fifth, do the city of London wait to be pressed to any judicial decision, before they make any further reimbursement of the sums which have been expended in the Southwark judicature?—I do not see how I can answer that question.

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## *Veneris*, 13° *die Aprilis*, 1821.

## MR. ALDERMAN WOOD,

### IN THE CHAIR.

*Robert Finch Newman, Esquire,*

R. F. Newman, Esq.

(13 April.)

Called; and delivered in a copy of a report of the select committee for letting the Bridge House estates, and stated, that the court of common council had agreed to such report, and had referred it back to the committee for letting the Bridge House estates, to take such measures thereon, as they should be advised, and to report from time to time to the court.

This report was read as follows:—

"To the Worshipful Committee for letting the Bridge House Estates.

"Pursuant to your order of the 22d day of March last, we have considered the report of the clerk of the works, Mr. Rennie, Mr. Chapman, and Mr. James Mountague, on the subject of London bridge; and it appearing to us, that the revenue arising from the Bridge House estates is by no means sufficient to defray the expense of the erection of a new bridge, we deemed it expedient to hold a conference with His Majesty's ministers on the subject, and appointed a deputation for the purpose, who have reported, that they had accordingly held a conference on the 30th of March last, with the right honourable the earl of Liverpool, and the right honourable Nicholas Vansittart, and were attended by Mr. Remembrancer, Mr. Comptroller, the clerk of the works, and Mr. James Mountague, when, having stated the various proceedings which have taken place with respect to the bridge, and that a sum sufficient to defray the expense of a new bridge could not be raised upon security of the Bridge House estates, the deputation requested to be informed, whether His Majesty's ministers would (in the event of its being deemed expedient that a new bridge should be erected) sanction the appropriation of a portion of the public revenues to such purpose, when Lord Liverpool stated, in most decided terms, that no such sanction would be given. His lordship and Mr. Vansittart, after some general discussion, expressed their opinion, that a sum of money might, with justice and propriety, be raised for the purpose by the means of tolls.

"We have since most attentively considered the subject; and although it is our opinion, that a new bridge would be the most eligible method of remedying the inconvenience complained of by the petitioners; yet, when it is considered that an expense greatly

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greatly beyond the means of the Bridge House funds, must be incurred in the erection of a new bridge, with the necessary approaches, which must therefore be provided for, either by tolls, or a charge on the orphans fund; against the former of which we entertain great objections; and against the latter we fear objections may be made in Parliament; and that so little is necessary to be done, to answer the purpose of the petitioners, that the construction of only two arches would effect that purpose. We are of opinion, that provided it shall appear, on examination, that the piles under the piers of the bridge are in a state to bear the additional weight which the piers would have to sustain, and that the examination can be made at a moderate expense, it will be expedient, first, to proceed to remove the water works, and then to adopt either the whole, or part, of the plan recommended by Messrs. Dance and others, in their report dated November 1814, as upon further consideration may be deemed advisable, in constructing arches of a sufficient size to afford the convenience required for the purposes of the navigation; which plan is within the means of the Bridge House funds, and will prevent, by a gradual enlargement of the waterway, any ill consequences which might be apprehended from the water overflowing the banks of the river, in consequence of a sudden removal of the dam: All which we submit to the consideration of this worshipful committee. Dated this 11th day of April 1821."

*John Rennie, Esquire,*

Called; (Examined by the Committee.)

*John Rennie, Esq.*

You have delivered in your report, dated the 12th of March last?—Yes.

Have you any thing to add, relative to it, independently of any question that may be asked you?—I do not know that I have any thing more to add to it.

Have you made any examination as to the state of the piers, in order to carry the alteration into effect?—I have not been able to do so.

Can you give the Committee any opinion, as to the state of the piers, for carrying that alteration into effect?—I have been so very unwell since I was employed by the corporation, that I have not as yet been able to venture upon the piers of London bridge.

Can you inform the Committee, what would be the probable expense attending the trying to ascertain, whether the piers be capable of bearing such an alteration as is proposed?—The most effectual method would be to put a coffre dam round each of them, and pump the water out of them; that would be attended with a great expense indeed, but in order to do it effectually, it can only be done by coffre dams.

Can you state to the Committee, what would be the probable expense of these coffre dams, in order to try the durability of the piers?—For the piers of a new bridge the coffre dams are estimated to be from 11,000*l.* to 12,000*l.* each; but if it were those piers on which the new arches of London bridge are to be supported, that were to be estimated, the expense would be much more than that.

Explain the reason?—Because the coffre dams would be much larger, and the current of water in which they would have to be placed being very great, they would require to be of greater strength.

Would it not be necessary, to act with certainty in the alteration of London bridge, to have as many coffre dams as you require piers to be altered?—To proceed with absolute certainty, it would certainly require as many coffre dams as there were piers to be altered; if four, it would require four; if six, it would require six; and at an expense probably of 18,000*l.* or 20,000*l.* each.

I wish to ask you, whether having examined one of the piers, by means of a coffre dam being sunk, and finding that that was sufficient to support the bridge without alteration, would that give the information required?—I think it would; but if the whole were to be examined, it would be more certain.

Be good enough to tell the Committee, whether you would think it safe to make the alteration suggested, without examining one or more of the piers by means of a coffre dam?—Certainly not.

In the estimate of the 92,000*l.* is there a calculation of the expense of a coffre dam for the experiment?—No; the present estimate is merely made upon the supposition that they will carry the weight without additional trials; there is a sum of money calculated for repairing the present starlings, but not for a trial of this kind.

Then if a trial should be thought necessary upon six piers, it will cost 120,000*l.* exclusive of the 92,000*l.* the expense estimated?—Yes; I should suppose it would.

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*John Rennie, Esq.*

(13 April.)

Can any probable opinion be formed of the strength of these piers, without the means that you recommend?—Why, I should not like to risk my reputation upon it in any other way.

Not sufficiently probable, to influence a decision upon the subject?—I should think not.

As now informed, do you think the more probable result of the two would be, that those piers, when examined, would be found sufficiently strong?—I should doubt it.

In the case of an examination being made, as to the state of one pier, by the means of a coffre dam, and that pier being found imperfect, would your recommendation be to abandon all hope of repairing and altering the present bridge, or would you go on to examine another pier by the same means?—Yes, I think I should examine a second pier.

Then we must conclude, that your mode of dealing with the defective pier, would be by supplying a new one in the room of the pier so found deficient?—Yes, certainly. In that case a very considerable sum of money would be added to the cost of the alteration of the bridge, because that pier, with the whole expense of its foundation, would be to be added to the whole cost.

That would be an additional expense added to the 92,000*l.*?—Certainly, and the coffre dam also. Suppose that the coffre dam cost 18,000*l.* or 20,000*l.* and that the expense of the new foundation of that pier, up to the level of the surface of the water, were to cost 15,000*l.* or 20,000*l.* more, then that must be added to the whole cost of the bridge.

If the course should be preferred, of altering the present bridge, what security would there be against the possibility of this difficulty arising, namely, that from the successive examination of each of the piers, they might all, one after another, be found defective; and a new pier being supplied in place of the old one in each successive case, you might ultimately get at the erection of a new but a much less perfect bridge, at a very much larger expenditure than if the old one were to be taken down, and a new one erected from the beginning?—Certainly that might happen.

If, on sinking a coffre dam, in order to examine one of the piers, that pier should be found extremely defective, and the piling under it in such a state as to require the driving new piles, could those piles be driven without removing part of the present structure?—As far as that pier is concerned it must be removed, and the arch on each side of it.

So that it would be necessary to remove the whole of the two arches, in order to make a good foundation?—Certainly.

Would not that entail a very great additional expense for the alteration?—It certainly would; but it must be here observed, that before the pier is to be tried in that way, the arch on each side must be previously taken down, as you could not try it with the arches standing.

Then at all events, in order to ascertain the strength of the present piers correctly, it would be necessary to remove so much of the present bridge as to render it impassable?—Yes; and for that purpose a sum has been included in the estimate, to make a temporary wooden bridge on the old starlings, while those repairs were going on.

Does that form a part of the 92,000*l.*?—Yes.

Could you form any estimate of what the expense would be, from the necessity of taking down an old and building a new pier, and driving new piles?—Yes; it would be attended with considerable expense.

The Committee beg to ask you, whether you are aware, when the former alteration took place, if there were any coffre dams sunk, in order to examine the state of the piers at that time?—No; I believe there were not.

The Committee mean the time when the great arch was made?—There was no coffre dam then sunk, as far as I have been informed; and it was upon that presumption that the expressions are used in the report that has been made, that the old piers would be as able to stand the weight of the new arches, as they were in regard to the great arch.

The Committee also beg to ask you, whether if one of the piers should be examined and found sound, you would think that a sufficient justification to proceed?—It would be so far satisfactory.

Is there not an estimate of one coffre dam in the sum of 92,000*l.* for a previous examination?—No; there has been a sum put into the present estimate of 92,000*l.* for repairing, but not for a coffre dam.

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*John Rennie, Esq.*

(13 April.)

Do you recollect giving evidence upon the subject of London bridge, before the Committee upon the Southwark bridge?—I do.

Do you remember making any particular statement of a defect in one of the piers of London bridge at that time?—Yes, I do.

In which statement you described a fissure into which you poked a boat-hook to a very considerable depth, and from which you appeared to infer that there was great danger to that pier, and which danger was likely particularly to occur on the breaking up of any great frost?—I did; and that is one of the piers proposed to be taken down and rebuilt.

In the formation of the new arches?—Yes.

Have you any reason since to alter the opinion you gave then, that that pier was in a perilous state?—I think the opinion I gave at that time was, that if it should so happen in the commencement of the winter, that the starling should receive any damage, and that if a succession of floods took place after that damage was so done, before that starling could be repaired, that then it was the most likely time that London bridge might be carried away; but I am not aware of ever having stated, that there was any immediate danger of London bridge giving way, except from some such event as that I described.

If the old piers were to be removed, in order to build a new bridge, would coffre dams be necessary in order to remove the foundation of the present piers?—No.

In what way would they be removed?—First of all the piles would be pulled up, and the stones round them would be ballasted up from the bottom of the river, and carried away.

The Committee have before them your estimate for the alteration of the bridge, the probable cost of which is 92,000*l*; and also an estimate for building an entirely new bridge, the probable expense of which is 430,000*l*.; now, with a view to the probable accuracy of these estimates, the Committee wish to ask you generally, in your estimates of expense, which of them you found to give the nearest approximation of the ultimate result, the estimate for the alteration of the old building, or the estimate for making a building entirely new. Which of them vary the most?—The estimate for alterations always.

Then, applying your judgment to this particular case, the Committee would ask you, whether the probable unforeseen expenses, and the probable unforeseen difficulties in making the alteration in the bridge which is proposed, are not likely to lead to a greater amount of unforeseen expense, than if you made the bridge *de novo?*—Certainly.

In the estimate of 430,000*l*. for building a new bridge, have you calculated the expense of removing the old one?—I conceive the materials of the old bridge would nearly remove itself.

In the estimate of the 430,000*l*. for building the new bridge, are you enabled to state, from the best opinion you can give, and your best conclusion upon the subject, that a contract might be made to build that new bridge, at the price which you and the other surveyors have fixed it at?—I have no doubt it could be so made.

Then at the present moment, and at the present price of materials, do you think that a person would undertake to complete the bridge for 430,000*l*.—I do.

And persons of such respectability, that you could have no doubt of the execution of it?—Yes, certainly; it must be understood, however, that the 20,000*l*. for the temporary bridge is not included in the 430,000*l*; 20,000*l*. more being mentioned in the report for that purpose.

The Committee wish to know, whether there be included in that expense, the expense of stairs for watermen?—Yes.

Can you give the Committee any information with respect to the real expense incurred in building Waterloo bridge, which can tend to confirm or illustrate your estimate of 430,000*l*. for building a new London bridge?—I have compared the magnitude of the two bridges, and the price of materials together, and I find that taking the ratio of the magnitude of each, I have gone nearly 50,000*l*. beyond what that ratio amounts to, compared with the Waterloo bridge.

You have stated, that you had not included the expense of the temporary bridge in your calculation of 430,000*l*.?—No.

Would you build the new bridge on the site of the old one?—The estimates have been formed upon the supposition, that the new bridge is to be built upon the site of the old one.

Would not the expense be very materially increased, by building the new bridge upon the site of the other, by the expense of coffre dams?—The strength of the current

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*John Rennie,*
*Esq.*
(13 April.)

current through the present bridge, and the unmanageable state of the barges when passing through it, would render it an exceedingly difficult thing to build a new bridge near the present one, supposing the present one to be left standing. Our idea was, to build a temporary bridge first of all, and then to take down the present bridge.

You have stated, that the uncertainties as to the calculation in repairing the old bridge, are much greater than the uncertainties of building a new one; are you capable of calculating, whether there be not more than enough to answer for that equivalent by the laying out of 100,000*l.* instead of 300,000*l.* by the accumulation of the interest upon the sum saved?—There is no doubt in point of cheapness, that the alteration of the present bridge would be less expense than a new one.

In that case, by cheapness you mean that there is no doubt that a less sum of money would be laid out?—Certainly.

Do you mean by cheapness, that the public would obtain greater value for the money, or are the Committee to understand, that by going to the expense of building a new bridge, including the probable superiority of its structure, and the increased accommodation to the public, by its affording a larger water-way, and consequently a facility of passage; or do you mean, that in the end the public would obtain as much value for the lesser result as for the larger?—The larger sum would give the most certain result.

You have stated, that in your opinion, persons could be found to contract for building a new bridge for 430,000*l.* taking all the expenses upon themselves; do you think that any person would be found to contract for the alteration of the old bridge as required, and as estimated, at 92,000*l.* and to take upon themselves all the risk of the state of the piers?—The same persons to whom it was proposed to undertake the new bridge at 430,000*l.* declined undertaking the other at 92,000*l.*

With regard to the expense after the alterations, what would be the probable annual expense attendant upon that bridge so altered, compared with the new bridge?—I think that that question had better be put to others; those who are accustomed to repair the present bridge can best answer that question.

Was it contemplated that this temporary bridge was to be for the draught of carts, or for foot passengers only?—For both.

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## *Lunæ*, 16° *die Aprilis*, 1821.

## MR. ALDERMAN WOOD,

IN THE CHAIR.

### *John Rennie, Esq.*

Again called, and examined by the Committee.

*John Rennie,*
*Esq.*
(16 April.)

You having stated to the Committee, that a coffre dam, large enough to include any of the present starlings, would exceed in expense a coffre dam, such as would be necessary for the construction of a new pier, by a sum of above 6,000*l.*; the Committee wish to know, whether in your proposed plan for a new bridge, it occurs to you that the site of any new pier would be the same as that of an existing pier, of the solidity of which you would wish to make a trial?—Yes.

So that in the event of a pier not being found trustworthy, and it being afterwards determined to build a new bridge, that coffre dam would answer for one pier of a new bridge?—Yes.

Do you consider the present site as the fittest position for a new bridge?—It would save a great deal of money in regard to the expense of making new approaches, and upon that ground it was taken as the site where the new bridge should be placed; if the site be altered, new approaches entirely would become necessary, which would lead to a very heavy expense.

Would it be absolutely necessary to expend more money in the approaches to the new bridge than it would be to the old one, if the old one were altered?—Taking Thames-street as the point of departure upon the one side, and Tooley-street as the point of departure on the other, the new bridge, supposing Thames-street to be raised more than nine inches, and the street opposite the end of Tooley-street to be raised three feet nine inches, the rise to the bridge would be one foot in twenty-four

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four in length on the city side, but on the borough side it would be one foot rise in twenty-one feet and a half in length; in this case, very little property would be requisite for a new bridge, but if the clear height of the middle arch were reduced to 28 feet, which is the height of Blackfriars bridge above water, then the rise upon Thames-street side would be about one foot in twenty-six feet, and on Tooley-street, on the borough side, would be one foot in twenty-five feet. Now Blackfriars bridge, near to Chatham-place, rises one foot in seventeen feet, and Westminster bridge rises about one foot in twenty-eight feet, except at the very ends, where it is a trifle more.

What is it at the ends?—I do not know.

What the Committee thought you stated formerly was, that the rise at Westminster bridge is one foot in twenty-five feet at the steepest part, as it immediately rises at Parliament-street?—I do not mean to say so.

From this statement which you have now made, the Committee are to conceive you do not think it necessary to alter materially the approaches to London bridge, in the event of a new bridge?—Certainly not; but I conceive, that if they were to be altered to a further extent, the approaches would be easier in proportion as they would be extended.

Can you give us the rise of the carriage-way of the present bridge?—I cannot state that exactly, but there is the elevation of all the five bridges [*handing in a plan to which the witness referred ihe Committee.*]

If it were thought right to alter the present bridge, instead of making a new one, would the arches, which it is proposed to add to the existing bridge, have the same height of water-way as the centre arch now in existence?—I believe it is intended, if the bridge were altered, to raise one of the new arches six feet above the present arch, making a clear water-way of twenty-one feet three inches, as mentioned in the report. It is now fifteen feet three inches.

Are the Committee to understand then, that if there be to be a new arch, that new arch would become the centre arch of the bridge?—It would be a new arch that would be higher than the others, and which might be called the centre arch.

Is it possible that that arch could be in the centre of the bridge?—It is not exactly in the centre, but it is near it.

On which side of the present largest arch would this high arch be added?—It would be upon the London side.

If a new bridge were to be built, what additional height of water-way would you propose to give it, comparing it with the present water-way?—Fourteen feet three inches higher than the present bridge.

Do you take that at low or at high water?—From the present height of the high water-mark; from the surface of the high water of an ordinary spring tide under the centre arch, it would be twenty-nine feet six inches, which is fourteen feet three inches higher than the middle arch of the present bridge.

You mean the crown of the arch?—Yes.

Which would be eight feet three inches higher than the highest arch, if the bridge be altered?—Yes.

Be so good as state which would be the highest, the arch at high water-mark in the bridge, which it is proposed to build, or the crown of the arches of Southwark bridge?—Just the same height.

But higher than Blackfriars bridge?—Southwark bridge is only sixteen inches higher than Blackfriars bridge.

State whether, upon a comparative arrangement of the series of bridges being made, is it not in your opinion desirable, that the lowest bridge down the river should be higher than the others?—Certainly; Southwark bridge is twenty-nine feet six inches above the high water of an ordinary spring tide: Blackfriars bridge is twenty-eight feet two inches: Waterloo bridge is twenty-seven feet three inches: and Westminster bridge is twenty-six feet two inches.

In case a new bridge were to be built upon the plan proposed, in order to attain the ascent to it which you propose, is it necessary to interfere with St. Magnus church?—It may be done without interfering with St. Magnus church in any injurious way.

Would it be necessary to take down any building on either side of the water?—By allowing the approaches to be as steep as I have named, it would not be necessary on the city side; but on the other side, to make the rise nearly the same, there would be a few houses to pull down; but if you admit the rise to be as great as at Blackfriars bridge, it might be done without it.

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In order to obtain the additional rise that would be necessary for the altered bridge on the Southwark side, would it be necessary to pull down as many houses, as in the case of building a new bridge?—It would not.

Be so good to state the amount of the difference?—I have not valued the houses at all. Upon making the altered bridge, I would not pull down any houses at all, except perhaps, one upon each side, in order to make the approach of the temporary bridge, and perhaps even that might be saved.

Could that be saved in building a new bridge?—No.

It would in that case be necessary to pull down houses upon each side?—Yes; perhaps six or more might be necessary to be pulled down, but I have not surveyed them. If you raise Tooley-street three feet nine inches, as far as that approach went, it would come across the doors of the houses, and would destroy the under stories, and therefore some houses must be pulled down on that end of the bridge, both at Tooley-street and the High-street; but if you admitted of a very steep approach to the new bridge at that end, that is, the same as at Blackfriars bridge, I do not apprehend that six houses should be pulled down.

There would be no absolute necessity for so doing?—If you admit of the steepness being left in the same state at the end, as at Blackfriars bridge, namely, about one foot in seventeen.

Those houses which you would pull down, in order to form a temporary bridge, would be the same houses which it would be necessary to pull down, in order to render the approach very commodious?—Certainly.

What is the width of the road-way on the present bridge?—I think about forty-four or forty-five feet.

The footpaths are how wide?—I believe the footpaths are about seven feet wide.

What would you propose to make the width of the new bridge?—The same width as the old one; London bridge is wider than either Southwark, Blackfriars, or Waterloo bridges.

Would it be possible to raise the street at the end of Tooley-street three feet and a half, without taking down houses?—It is possible, but not adviseable.

It appears, by the report which the Committee have before them, that in the case of a new bridge being built, the public would obtain a much larger addition to the clear waterway, than they would by the proposed alterations; can you state, that the Committee may rely upon the figures stated in that report being accurate or correct?—I believe the Committee may take them as being so.

Have you any thing to state as to the advantages to be derived from it?—They are all stated in the report.

You are of opinion, that the largest addition that could be made to the clear waterway under London bridge, would have a favourable effect in regard to the navigation of the river, and facilitate vessels passing through it?—I have no hesitation in saying, that if a new bridge be built in the room of the present London bridge, that not only will barges be able to move much earlier in the tide to and from the different wharfs, but the benefits arising from it will be felt in the navigation of the river both below and above London bridge, to a very great extent; it is mentioned in that report; if I may be permitted to make one observation, I would say, that if that report were to be made part of the Committee's proceedings, it contains every thing that I can state upon the subject.

Does not the increased size of London, meaning the quantity of ground that is covered with the pavement of roads, very much increase the quantity of mud that is discharged into the river Thames?—Some years since I was employed by the commissioners of sewers for Westminster, to lay down a general scheme, for the improvement of the sewers, and the better drainage of the district of Westminster; and upon that occasion I made a calculation of the probable quantity of mud and rubbish that was carried from the streets and houses of London into the Thames, which amounted to nearly 800,000 tons annually; but the Committee are aware, that a calculation of this kind cannot be expected to be correct; there is no doubt, however, from the increased magnitude of London, the quantity so carried into the Thames must be very much increased; that calculation was made about twelve years ago.

Does not that increase become a very inconvenient deposit in the lower parts of the river?—Very much so indeed.

And that is found to be an increasing evil in the river Thames?—It is.

Is not an increased waterway through London bridge the most probable means of diminishing

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diminishing that evil?—It is; but there is a certain limit to be observed in regard to the extent of that waterway; for if London bridge be made much larger than any of the others, it will not tend to increase the improvement of the navigation; it was considered, by the other gentlemen and myself, who were employed upon this occasion, that an increased area, beyond that of the area of Southwark bridge, of about five hundred or six hundred feet, was as much as could be beneficially required.

Lineal feet you mean?—No, superficial feet.

If the bridge were to be altered, the area at high water would be considerably less than Southwark bridge; and, in order to get as great an area as possible, you propose to lower the heights of the starlings, and deepen the waterway at the small arches, in your report?—We do not propose to lower the starlings in this report; that was in the former report.

Then the Committee beg to ask you, do you, in your idea of the alteration of London bridge, propose to lower the height of the starlings, and deepen the waterway in the small arches?—Neither of these are proposed in this report.

Then, if that were found to be necessary, the expense of doing so is not included in the 92,000 *l.*?—It is not.

It is stated here, that the doing of that would cause considerable additional expense; can you state how much?—That has not been estimated by me. We doubted, indeed, about the propriety of doing so.

Do you think that it would be practicable to lower the height of the starlings and deepen the waterways, if the proposed alterations were to take place, without endangering the safety of the bridge?—I consider it practicable, but it did not appear to me to be safe to do it.

Could the starlings effectually be lowered without the use of coffre dams?—Yes, they could.

Has there been any considerable expenditure of money in removing this deposit of mud in the lower bed of the river?—I think at Woolwich alone it has cost 113,000 *l.*

Do you believe, that so large an addition to the waterway as is proposed to be given by the erection of a new bridge, would, if it had formerly existed, have had such an effect upon the river, as in any material degree to remove the necessity of incurring that expense?—I have no doubt it would lessen the expense of removing the mud very materially indeed.

Since what period has the 113,000 *l.* been expended?—In three or four years.

From what date?—About eight or nine years back. I think I computed about that time, that in order to keep the mud from increasing at Woolwich, would be somewhere about 15,000 *l.* a year. Now, I must mention to the Committee, that the mud became so excessively annoying and inconvenient at Woolwich, that lord Melville determined to remove the whole of the ships moored in ordinary at Woolwich; and since that time there has not been so great an accumulation as before; the vessels used to ground and strain themselves.

You have stated in your report, that there are probably some hard shoals in the river, necessary to be removed by artificial means; would the removal of those shoals in your opinion endanger the foundation of the present bridge?—Of course the waterway would scour so much deeper; but as the current of water would be lessened by the enlarging of the arches, I do not apprehend that any danger would arise to the bridge if altered in that way.

If you were to build a new bridge, would the removal of those shoals endanger its safety?—Certainly not.

It has been said, that the new bridge must fall if such shoals were to be removed, but that is not your judgment?—Certainly not.

Have you any calcalation made, which could enable you to judge of the probable number of tons of stone that would be required for a new bridge?—If I had had the least idea that such a question would be put, I could have informed the Committee, but I will send for that account.

Have the goodness to furnish the Committee with such account?—I will furnish it. [*The witness subsequently gave in the following statement.*] The quantity of stone required for a new bridge will be about 70,000 tons, which, at eight shillings per ton duty, will amount to 28,000 *l.*

(Examined by the Committee, on behalf of Mr. Randle Jackson, as counsel for the city, who was necessarily absent.)

Have you any doubt of the proposed alteration of the bridge being executed for

92,000 *l.*

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92,000 *l.* supposing the piers to be in a fit state to receive the new work?—According to our calculation it is so, and I have no doubt our calculation is fair; only I may observe, that in pulling down a work of that kind, one cannot always say what may occur in the course of doing it, but we have made considerable allowances for that purpose.

The Committee wish to know, whether the proposed height of the centre arch in the new bridge, would not carry the approach much farther than at present into the borough, and into the city at Fish-street hill?—That is all answered already.

Have you formed any calculation or conjecture as to the probable amount of indemnity for pulling down property, for the purposes of making approaches to the bridge?—I have not.

If you were surveyor to the corporation of London, would you advise them to commence building a new bridge, till they had accurately estimated that amount?—Certainly not.

Might not that expense amount to as much, or nearly as much, as the new bridge?—I should think very very much less indeed; but I think, if the Committee will recollect the statements that have been before made, the cost may be large or very moderate, according as the approaches are steep or flat.

In the estimate of 92,000 *l.* for the alteration, do you include the sum to be paid for new approaches?—Nothing but the mere alteration of the bridge.

Would any new approaches be necessary in the proposed alterations?—They would not follow as a matter of necessity, certainly.

If the piers should admit of the proposed alteration, would, in your opinion, the old bridge last for a very long period of time?—I should think it might; but not having examined the state of the starlings and foundations myself, I cannot speak positively to that point myself.

*Wm. Chapman, Esq.*

Called; (Examined by the Committee.)

*William Chapman, Esq.*

There is a report dated the 12th of March last; did you sign that?—Yes, I did.

Having delivered in this report some time ago, have you any thing to add to it?—No, I cannot say that I have; it was given generally, and every part of the subject was particularly adverted to.

You are a civil engineer?—Yes.

You are not usually in the employment of the corporation of London?—No, I am not in their service.

You were, however, called in upon this occasion by the city of London?—Yes.

Your residence is in the North?—It is in Newcastle.

Have you been accustomed to direct and superintend the building of bridges?—I have been accustomed both to the chief direction of the building of bridges, and to the repairing of them.

Have you superintended the building of any number of bridges, and what are those bridges?—One of those bridges was a bridge over the rapid part of the Liffey, called the New Bridge, which was founded in coffre dams.

Where is that situated, above or below Dublin?—Above Dublin; it is upon the road to the Curragh of Kildare.

What others?—One bridge lower down the Liffey, and another higher up; they were repaired under my direction, and new arches built.

Have you attended any in England?—Yes; there is a bridge over the river Shief at Sheffield, consisting only of one arch; and also to the repairs of several large bridges over the river Tyne, a very rapid river, and many smaller bridges.

Have you had an opportunity of examining the foundation of London bridge; the piles of London bridge?—I have; I went to examine it on Saturday. Previously to that, Mr. Mountague had given directions to make an excavation within the front of the starling upon the north side of the centre arch, in consequence of which I was enabled to look under a part of the foundation; but deeming it necessary to examine further, the people have been at work ever since at the proper times of tide, so as to enable a further investigation to be made; I also, seeing that a part of the foundation of the ancient chapel, which had stood upon the tenth pier, was still in existence, and consisted of rubble masonry, directed a cut to be made across the

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*William Chapman, Esq.*

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site of the chapel, conceiving that the foundation of the chapel would be the same as the foundation under the piers. On examining that, I find that the chapel pier is composed of a number of piles surrounding it, and some few scattered piles in the interior, but what the number might be I am not as yet sufficiently enabled to state. There were likewise longitudinal beams running up and down the stream of that foundation; and I observed, that all the intervals between the piles were filled up with chalk, Kentish ragg, and a cement formed of tarras and lime and sand [*witness showing a specimen*], and in consequence of the hardness of that foundation, the work has gone on but slowly. I cut off a portion of the piles, which I have brought with me [*witness showing them to the Committee.*] As for the soundness of the piles, I have no doubt of their lasting for ages to come; because in a late excavation for a ship canal from Solway Frith to Carlisle, we cut through a forest of oak which laid under the roman wall, and therefore must have been there previously to the period at which that was built, and the wood was in so perfect a state, that I directed a portion of it to be made use of in the works of the canal. I also must observe, that I found a solid mass of masonry on the north side of the middle portion of the ninth pier, down to seven feet three inches below the top of the starling [*witness showing the situation in a plan which he handed in*]; and I must add, that this rested on a broad sill or piece of timber supported upon piles, and was surrounded by an external casing of piles, rising two feet three inches above the said foundation, upon which a projecting course of the pier was sustained. The interior of that pier, so far as already examined, consisted of a mass of Kentish ragg, chalk and tarras, cement very difficult to penetrate through, in which were several piles. In fine, I deem this foundation perfectly capable of sustaining a greater load than at present; but that when a new arch is thrown over, it is proposed to lighten the load upon the centre arch by the substitution of open spendril walls, covered with corbells and flags, over which a roadway is formed similarly to what has been done in France, and in the building of Waterloo bridge.

Is the pier that you have been examining so minutely, the pier that is to carry the great arch?—Yes, it is.

Upon your examination of it, do you think the foundation generally capable of bearing the proposed new superstructure?—It is impossible to say what the others are.

This experiment which you have made, has only been since Saturday last?—I believe they made an excavation previously, but my examination of it was on Saturday and this morning.

Have you any doubts in the examination you have made, of that being capable of carrying the weight it is intended to carry by the proposed alteration?—I have not the least doubt of that pier.

If it were left to you to execute the proposed alteration of the new bridge, would you venture to build the new arch upon this pier, without examining it with a coffre dam, in the way proposed by Mr. Rennie?—I am of opinion that coffre dams are extremely expensive, and that if the bridge should require such an examination, it ought not to be repaired.

If you, as a professional man, were to make the proposed alteration, would you venture to execute the work without an examination by coffre dams?—Certainly, I should.

Do you mean to say, that you would do so without any further examination than that which is now making?—If nothing to the contrary appear in the process of the examination, I conceive it perfectly safe to make that pier the abutment of a new arch.

Are you of a decided opinion, that the examination that is now going on, is such an examination as you would depend upon, as to the erection of an abutment to that pier, and that that would be able to carry all the weight that is proposed to carry?—Yes; and should any individual pier be found deficient, it might be improved, provided not forming an abutment of a remaining arch, but designed to be an intermediate pier between two of the other proposed arches. I am of opinion, that if such pier should be found deficient, it would possibly be expedient to take it down to nearly low water, and drive a series of piles under its intended foundation, laying a platform upon them, and subsequently building the superstructure of the pier; that was the process used in regard to Newcastle bridge, which is more subject to impetuous floods than even London bridge.

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*William Chapman, Esq.* (16 April.)

How long has that bridge at Newcastle been built?—I do not know; but it has been altered or rebuilt about forty-five years ago.

Did you make the alteration?—I had nothing to do with it.

Then you do not speak of your own knowledge?—No, but I have been at it frequently, and have seen it, and have conversed with the carpenters and engineer.

Is it possible at Newcastle bridge, for you to see the foundation of the bridge, from the state of the tides, so as to see the piers?—I recollect perfectly well seeing the process going on, but I did not pay particular attention to it. I can speak as to several of the piers of my own knowledge.

Is there such a fall of water at Newcastle bridge, as there is at London bridge?—No.

Do you think, as a professional man, that that foundation which you described, is sufficiently substantial to build a bridge upon?—Yes, and I shall give the Committee a proof in corroboration of it. The Committee will find in the records of the corporation, that there has been twenty-four feet depth at low water, under the present centre arch, and if the piers of that arch have supported the superstructure under such a depth of water, they certainly must be capable of doing so under a depth of ten feet at low water, which is the utmost depth proposed to be admitted.

Does the Committee understand you to say, that the depth of water is now ten feet at low water?—It is not so much.

Even with that ten feet, if the Committee understand you rightly, the piles are so much out of the ground, that you can examine the piles themselves?—Certainly; the heads of them fourteen feet above the proposed bottom of water way.

Then the piles must have been fourteen feet out of the ground, as you say you have been able to examine the piles themselves?—Yes, as before stated; but the shaft of the piers of the bridge is now several feet above low water.

You say you are able to examine the piles upon which the pier is founded?—Yes.

They are still out of the ground at ten feet water; if the river be now up fourteen feet, they must have been fourteen or fifteen feet out of the ground?—The present foundation of the pier is seven feet three inches below the starling height, and the starlings are eleven feet above the low water-mark below bridge, and therefore taking seven feet three inches from eleven feet, the Committee have three feet nine inches, so that they are three feet nine inches above low water. I speak of the piles of the piers of the bridge.

How far are they now out of the river?—They are three feet nine inches above low water mark, and formerly there have been twenty-four feet depth of water, so that the heads of those piles must be twenty-seven feet nine inches above the former channel of the centre arch.

You conceive it to be twenty-seven feet nine inches?—The platform of the bridge, which unites the piles together, is three feet nine inches above low water, and the depth at low water, under the centre arch, has been twenty-four feet, therefore the foundation of the bridge is twenty-seven feet nine inches above the then bottom of the river, under the arches; the masonry of the foundation is three feet nine inches above low water.

The piles are three feet nine inches out of the water?—Yes; I speak of what it is proposed to be when finished.

The Committee understood you to say, that the piles are now three feet nine inches above the bed of the river?—No, I mean above low water mark; that is the mistake.

What practical conclusion do you draw from the facts you have now stated?—The conclusion I draw is this, that when the work is completed as intended, it is not proposed to have a greater depth at low water under the arches than ten feet, and that there has been under the present centre arch twenty-four feet depth at low water; therefore, if these piles were capable of supporting their superstructure under a depth of twenty-four feet at low water, they necessarily must be capable of doing so under a depth of only ten feet.

That is assuming that they are now as strong as at the time when they were in a greater degree exposed?—Yes; I assume that I have given you proof of that also.

How many feet have you gone into the piers?—Only about five feet; they have been interrupted by cutting through the piles, and by the hardness of the masonry.

At what level is the examination that is now making?—The base of it is at three feet above low water mark, as that is the criterion already mentioned; and the top of that excavation is six feet above low water mark.

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Is there any reason whatever to feel assured, that all the parts of the structure which are below the point you are at present examining, are of such strength as to be with certainty depended upon?—There can be no doubt of the soundness of the piles.

For what purpose have the starlings been put round the piles?—Because, in general, the piles were open; that is to say, not closely attached to each other.

Is not that circumstance of their position a source of weakness; if sound, why were they surrounded by piles?—It certainly is a source of weakness, but they are not uniformly in that way.

The Committee wish to know, whether, by any examination at present taking, you can ascertain that any part of the piles is in the bed of the river?—It is impossible to draw those piles that lie under the pier; but there can be no reason to doubt that they did reach into the bed of the river, because otherwise they could have founded nothing upon them.

What is the length then of the longest piles within your own knowledge, that have been used to drive into rivers for foundations?—They generally give them not less than six or eight feet hold of the ground below.

What is the longest pile you ever knew driven into any river?—I cannot call to my recollection what has been the longest, but I believe I have seen them from twenty-four to thirty feet.

These piles undoubtedly were originally driven for the security of that pier?—Yes.

The Committee presume you are now talking of the pier, upon which there was formerly a chapel standing?—Not now, but I was going to make a reference to it; they were driven, for the security of the incumbent weight, into the bed of the river.

Would you therefore be responsible for building the bridge, as intended, without a further examination than you have taken, to ascertain that those piles are now standing in the bed of the river?—I look upon the circumstance of the piers of the bridge being supported, when there was twenty-four feet depth at low water, as a certain proof, that they could sustain the weight at ten feet under low water.

Is that a sufficient reason?—It appears to be a sufficient reason, but I was going to give a further explanation; in the construction of the bridge, there was a great prolongation to the eastward of the tenth pier, upon which the chapel was built; there is every reason to conclude, that the foundation of the chapel would be the same as the foundation under the piers, and that the piles under that part of the foundation may be drawn in order to ascertain their depth.

But suppose now that you should be mistaken, and that the piles were not found to be in the bed of the river, would you then venture to build upon that pier as it now stands?—I have already given the Committee a reason for so saying, and have stated, that instead of having to stand with 24 feet depth at low water, it would only have to remain under the depth of 10 feet.

Do you think it would be safe to remove any of the starlings that now surround the piles?—The starlings have been both heightened and widened, for the purpose of making a great fall of water for the waterworks; and, therefore, I presume that they might be reduced to the same state in which they were before, if requisite; but it is not at present proposed to be done.

If, therefore, the starlings were removed, do you think that the piers would be sufficient to carry the present bridge?—No, I think it would fall; there is no doubt of that.

If the Committee understand you rightly, you have stated that the masonry of the pier you have examined, does not go lower than three feet nine inches above low water mark?—Yes.

So that any foundation to support those piers must consist of piles?—Yes, excepting so far as they may have been filled in with Kentish ragg, chalk, and cement; there is reason to conclude that that was the mode of building.

Still your opinion is, that it was originally built upon piles, which were three feet nine inches above the low water mark?—Yes, but they have been filled up with those materials, and must have had their feet in the bed of the river.

At the time of the original building of the bridge?—Yes.

So that that which actually supports the piers above the hard ground is composed of wood?—Yes; mixed with those materials I have mentioned.

Therefore, when there is now ten feet of water, the wood work must extend to thirteen feet nine inches from the supposed bed of the river?—Yes, from the intended channel under the arches.

You

*William Chapman, Esq.* (16 April.)

You also stated, that formerly there were fourteen feet more water under the bridge than there is now?—Yes.

Then formerly the piles, which supported the whole structure of London bridge, must have been 27 feet 9 inches out of the bed of the river?—The head of the piles must have been 27 feet 9 inches out of the bed of the river.

And that is within two feet three inches of the longest pile you ever saw in your life?—Yes, but you may drive a longer pile; there is no limitation; but the length of pile mentioned relates to the starlings.

Do you think it would be possible in these days, or would you be satisfied, as an architect, giving security for the bridge standing for twenty years, would you be satisfied with building such a bridge, and of the same height as London bridge, upon piles standing 27 feet 9 inches out of the bed of the river?—No, I would not wish to do it; but if the piles under the water have supported it when surrounded by starlings, it is evident that they are still capable of it, under much less depth of water, it being now less than one half.

Then would you be willing to undertake the proposed alteration, and enter into good security for the bridge after it is done?—I never have been a bridge undertaker; but it would depend upon their giving money enough, in which case undertakers may be had.

As the bridge has been widened on each side, there must have been a division of masonry?—Yes, there is.

Are there three?—We have only examined one.

That being the case, can that be so strong as if it were in one solid piece of masonry?—No, I should prefer it in one solid piece of masonry. There is a recent instance at York, of a bridge being built in two different halfs longitudinally, and many bridges are widened.

Do you think the starlings can be lowered into the water, and the waterway under the small arches deepened, as required in the report of 1814, without endangering the bridge?—I think the waterways may be deepened as required in that report, and that the starlings may be advantageously lowered to the depth of the masonry, be it what it may.

The Committee perceive, that when you are stating about the piers being capable of bearing the alteration of the bridge you have the idea of, there being ten feet of them in the water under the bridge?—No; it is proposed to be levelled at that height with a base of Kentish ragg between the piers, as at present.

If the waterway were to be considerably deepened, would that endanger the foundation of the altered bridge?—The velocity of the water would be diminished one half, and the waterway increased double.

Does the flux and reflux of the tide deepen the bed of the river?—No, not now essentially under the arches; and when the velocity of the water is diminished one half, the power of removal will be decreased to one fourth.

You have stated in your report, that the alteration would occasion the water to act more powerfully, and cause a considerable increased depth of water; would not that occasion danger to the altered structure?—No, as the velocity would be decreased through the bridge.

Supposing, that by such a free flow of water, the water would be deepened?—I presume the depth of water will be kept at ten feet by an artificial bottom of Kentish ragg.

Do you propose to put in this Kentish ragg, so as to prevent the river deepening more than ten feet, and that that would render the bridge sufficiently strong? —Yes.

You have said, that if all the starlings of the bridge were removed, the bridge would not only be in considerable danger, but in your opinion it would fall?—Yes.

Do not you think that the starlings, in their present situation, are impediments to the navigation of the river?—They undoubtedly are.

If they were removed, the navigation of the river would be considerably improved? —Certainly.

If those starlings should appear to be weakened, or should decay, as they have done, what is the usual mode of repairing them at this moment?—The cause of the present decay is the velocity of the water.

The Committee ask you now this question; if those starlings which exist at present were, from age, or from the effect of the tides, or from accident, to decay, what

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is the mode by which they are amended and supported?—If you will give me leave, I will show that the cause will no longer exist.

But if it actually exist, the Committee wish to know what is the mode of counteracting it?—By the decreased velocity of the water.

That has not been the way by which the starlings have been supported hitherto; we have it in evidence, that the starlings have been supported by making greater accessions to them, and by throwing rubble into the river?—Yes.

That has been so done to support the present starlings; does not that mode of supporting them materially injure the navigation of the river?—Yes, but if ten feet of depth be given, there would be no injury, as no accession would be requisite to the starlings, and there would be navigable depth at low water.

Then you mean to keep it at ten feet of depth, as you have said, by putting Kentish ragg at the bottom?—Yes.

Then that must be masonry?—No, by no means, but thrown into the bottom.

Will not the operation of the tide have the effect of carrying that Kentish ragg sometimes away?—It will never have velocity enough, as it will be diminished in velocity by one half.

Do you mean to say, that by no increased velocity of tide by floods or high tides, the water will carry that Kentish ragg away when those arches are made?—By an increased waterway it is impossible that the velocity can ever approximate to what it is at present.

After having examined the present bridge so minutely as you have done since you signed the report, are you still of opinion, that it would be better to build a new bridge?—Certainly, that would be preferable,

Are you of the same opinion as is stated in your report, that still it would be better to build a new bridge?—Yes; but I am equally of opinion, that the alteration might answer the purpose, although not admitting of the same perfection.

What in your opinion would be the annual expense of repairing the starlings, providing the old bridge should remain, with the alterations proposed?—I should think it will be reduced at least one half, or probably two thirds; but I give my opinion, because of the information I have received from carpenters employed upon the starlings of the old bridge at Newcastle, who said that they had formerly, in doing those repairs that were necessary, constant employment for all the free carpenters of that town, and that now the starlings of the bridge require no repairs at all since the alteration.

What was the nature of the alteration in that bridge?—Widening the arches, and reducing the starlings.

Do you not think it very desirable to have a greater area of waterway at London bridge than at any of the other bridges?—I think it is eligible.

And by the proposed alteration it would be less?—Yes.

But you feel confident, that the proposed alteration could be executed for this sum of 92,000*l.*?—I should suppose it might, as far as I have at present seen it; but it is impossible to speak as to those parts of it which I have not yet seen.

In general, is it possible to make an accurate estimate of old work; are not such estimates liable to great errors?—The estimates of repairing and altering old works cannot be expected to be approximated so nearly as new works.

Are you acquainted with any persons, builders of respectability and responsibility, who would undertake to execute the alterations proposed for the sum that has been estimated?—If the other piers are found to be as good as the one examined, I have no doubt that there might be some person found willing to undertake it; I mean, provided the other piers that are not yet examined, be found to be equal to the one I have examined.

Do you entertain any doubt, that a new bridge could be executed for the sum of 430,000*l*, according to the estimate?—No; I think it might be executed for the amount of the estimate.

From the examination which you have made, are you satisfied as to whether the water flows through the starlings or not?—I do not think it flows through the starlings at the depth I speak of, but I wish that a further examination should be made, by a pit being dug through the foundation of the antient chapel.

You also remain of the same opinion as stated in the report, that the erection of a new bridge would be preferable to the alteration of the old one?—There can be no doubt of it; all that I am warranted in saying is, that the old one is capable of being made efficient, but I certainly would prefer a new one.

*Martis,* 17° *die Aprilis,* 1821.

## MR. ALDERMAN WOOD,

IN THE CHAIR.

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*William Chapman, Esquire,*

Again called in; and Examined.

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*William Chapman, Esq.*
(17 April.)

I Think you stated to the Committee, on a former occasion, as your own opinion, that a new bridge would be more eligible than the alterations proposed?—Yes; I think a new bridge, taking all circumstances into consideration, would be the best, leaving out of the question the expense.

Which do you think would be the best, under all the circumstances?—I think it is entirely matter of finance; the navigation certainly will be better if a new bridge were to be erected.

In the estimate for the new bridge, are the Committee to understand in the 430,000 *l.* was included stairs on each side?—Yes.

Do you mean to put stairs in case of any alteration of the bridge?—They have not been in contemplation.

Then they are not included in the estimate of 92,000 *l.*?—No, they are not.

How much would foot stairs on each side of the bridge, if altered, amount to?—I am not prepared to answer that question.

Would not the alteration of the bridge necessarily cause an additional obstruction to the navigation, whilst the work was going on?—No, not essentially; because the two first arches proposed to be substituted for the four old ones, are in the place of four locks not navigable, excepting St. Mary's lock; when those two are made, there will be far more navigable waterway than at present.

If a new bridge were resolved upon, would not the obstruction to the navigation cease, as soon as a temporary bridge was erected and the old one removed?—Yes, the obstruction would certainly be less when the alteration should be made.

*Mr. Jackson.*—Do you believe that the footings of the piles which support the bridge are in the ground?—I certainly do; because if they were not in the ground it would be utterly impossible that the bridge could be supported by the pressure against the starlings.

If the proposed four large arches should be deemed insufficient to give a free passage to the water through London bridge, could any further additional waterway be made at a reasonable expense?—I conceive, that an addition of two new arches on the north side of those previously projected, leaving an intermediate small arch, to give uniformity to the design, might be constructed at a reasonable expense; because a temporary bridge, the centres for building the arches, the raising of the pavement, and the taking up of the parapet, are all works that necessarily must be done, whatever the number of arches may be.

Can you give the Committee any idea of the expense?—I should suppose that the expense would not exceed 20,000 *l.* or 10,000 *l.* an arch.

About how much addition of waterway would then be derived?—I cannot precisely say, without measuring or taking the dimensions of the piers; but it would be very considerable indeed.

Is there any plan to which you could apply your dividers, to enable you to answer that question: [*The witness referred to a plan.*]—The width of the starlings that would be removed appears to be sixty-two feet.

The question is, what additional waterway would be afforded by the two arches?—There would be 1,200 feet area of additional waterway at starling height.

Can you state what lineal additional waterway there would be?—The greatest width of piers that would be removed appears by the plan to be forty-three feet.

Do you mean that would be the lineal addition?—Yes; spring tides flow on an average eight feet above the starlings; but as the haunches of the arches would come down into the water, I would only call it six feet, which is far within bounds; therefore, 258 feet addition to what is already stated, making in all an addition of 1,458 in area of waterway, exclusive of what must arise from the necessary deepening on each side of the removed starlings.

Now state what would be the lineal addition of waterway?—It is already described; it is the width of the piers and the starlings.

Then the lineal addition would be the width of the starlings?—Yes, at low water; and at high water the width of the piers.

Can you state to the Committee, the probable effect of taking away the water works, and how far it would relieve the navigation?—Not knowing the precise extent of the obstruction, I cannot speak with precision, but I conceive it may be about a foot.

What do you mean by about a foot?—In the fall.

If the examination now going on, as to one of the piers, be extended to them all, would you be thereby enabled to give a decisive opinion, as to the practicability of altering the bridge in the manner suggested in your report to the Bridge House committee?—Certainly, I should be enabled to form a separate opinion of each pier, in the same manner as I have upon the one I have already examined.

About what do you suppose the expense of so examining each pier would be; state, if you can give an opinion, about what it would cost thus to examine each pier?—I can only state as to the expense of the dam; but Mr. Mountague is better able to speak to that, it depending upon the hardness of the materials.

You can only speak as to the dam?—No.

Do you suppose the other piers could be examined for somewhere about the same expense which has been incurred in examining one pier?—I presume they might.

Supposing the old bridge to be thus improved, do you think it would last for a very long period, or not?—It would then be less liable to receive injury than at present, because the velocity of the water would be decreased from what it is nearly to that of other bridges.

The question is, whether that bridge might be so altered and improved, that in your opinion it would last for a long period?—From the causes I have already given, I certainly conceive it might last for a very long period.

State something definite as to a long period?—For ages, with due attention.

When you signed the report, I would ask you, whether you had any doubt of the piers and foundation of the bridge being in a state of sufficient soundness to receive the new work?—It is generally expressed in the report, that there is no doubt that they might be made perfectly safe; I would refer to the words of the report.

As far as your subsequent examination has gone, since you signed that report, state whether you entertain any doubt of it now?—If the other piers prove like that, I entertain no doubt of it.

When you have undergone the examination of the piers, would you contract to make all the alterations you have suggested for 92,000*l.* taking the whole risk and expense upon yourself?—I have already answered, that I never made a contract with any one, because, as a civil engineer, it is not usual to do it.

When you say the altered bridge would last many years, do you mean if the starlings were to be removed?—I particularly adverted to the starlings in my examination of yesterday; I said the bridge would not stand without them, but that they would admit, in all probability, of being somewhat lowered, and in places contracted, to what they originally were, but to what extent I know not.

*Committee.*—Suppose the bridge could be altered, to have six new arches instead of four, it then would not possess so much waterway as Southwark bridge does?—No, it would not, undoubtedly.

And you have stated already, as your opinion, to make the navigation complete, it ought to be greater than Southwark bridge?—Yes, it ought to be greater; but its not being greater would not be material.

After half the examination had taken place, by cutting into the arches, do you believe that any person, taking all that risk upon himself, would contract to do all the proposed alterations of the bridge for the sum of 92,000*l.*?—If the examination should prove satisfactory, I have little doubt, but good efficient men might be had for the purpose.

Could you produce a person that would contract?—According to the terms they have given to me, I think they would.

Can you produce the person?—I have little doubt but it might be done.

Have you the slightest doubt in the world, that you could get more than one person to build a new bridge, for 430,000*l.* besides the temporary bridge, of course?—That estimate was made by Mr. Rennie, but I have no doubt of its correctness, because it was examined by us, and we approved of it.

Then you have no doubt, that you think persons might be obtained to undertake the work?—Yes.

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*Mr. Jackson.*—Do you mean by satisfactory, as satisfactory as your examination of the last pier proved?—Yes.

*Committee.*—If a new bridge was built entirely, the navigation would be better than if altered according to the proposed plan?—The navigation would be better undoubtedly. I conceive that I have no way contradicted the report that has been given in.

Are you decidedly of opinion, that a new bridge would be the best?—Yes.

But that it may be altered?—Yes; if the Committee will give me leave, I will make two or three observations that I omitted yesterday: it was inquired of me, yesterday, what was the greatest length of piles I had seen driven; I then could not precisely answer; but upon recollection I find, that under my direction, piles of thirty-six feet length were driven to form the pier of the packet-boat dock in Hull, not that they were driven to that full depth, for the depth to which piles are driven, depends only upon the nature of the foundation. I also omitted to state, that bridges may have an occasional appearance of failure, and yet not be in any essential danger, because fourteen years since, a bridge of seven large arches, over the river Tees, at Stockton, had the crowns of two of its arches sunk considerably, in consequence of which, I was called upon to devise what was requisite to save them, and on pursuing those measures which were laid down, the bridge has since continued stable. Also, in Cambridge, a bridge of eleven arches over the river Tyne, a similar event took place in one of the arches, and at the instance of the magistrates of the county, I made a complete examination of that bridge, and I found in one part of it, it was separated from the top to the bottom, but as the bridge was the only one that had stood the severe flood of 1772, which took away all the other bridges on the Tyne, I merely recommended the eventual repair of it; this circumstance took place in autumn last, and nothing has since been done, yet that bridge is in the same state as when I examined it.

Not repaired?—No, it is not repaired.

How much had those arches on the Tees sunk?—One of them five inches or upwards, and the other to the best of my recollection, three inches.

The counsel for the corporation being asked if he had closed his case, replied, that he had closed his case, as far as respected the first branch of the city's petition, by disproving the allegations of certain petitioners, relative to the conduct of the city, in the management of London bridge, and of the funds set apart for maintaining the same, but that he was desirous of calling evidence under the second branch of the city's petition, to show the practicability of the plan, which the corporation was willing to execute, as to the alteration of the present bridge, particularly with respect to the efficiency of the foundation, for sustaining the proposed new work; that further experiments had been begun, since doubts on that head had been very recently expressed; that such experiments were prosecuting with the utmost diligence, and he hoped soon to lay their result before the Committee; that he also proposed to call evidence to inform the Committee of the probable expense of making approaches to a new bridge; and that he also proposed to call evidence to prove, that the increased extent of waterway, and the increased number and size of large arches, in the case of the present bridge being altered, would afford infinitely more space and convenience to the trade and navigation of the Thames, than the petitioners themselves had desired.

*The Committee* asked Mr. Jackson, if he was then ready to proceed with such evidence.

*Mr. Jackson* answered, that he was not, his understanding being, that the Committee were now in a course of examining certain witnesses called by themselves.

### *William Mountague, Esquire,*

Again called in; and Examined by the Committee.

W. Mountague, Esq.

You are surveyor and clerk of the city works?—Yes.

Did you sign the report of the 12th of March, together with Mr. James Mountague, Mr. Rennie, and Mr. Chapman?—Yes, I did.

Have you any reason to alter your opinion with regard to that report?—None.

No circumstances have occurred since, to induce you to alter that report?—None.

Are

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*W. Mountague, Esq.*
(17 April.)

Are you acquainted with the result of the examination of Mr. Chapman, relative to the state of the pier? —I have not had any personal examination of the pier; I have certainly heard what Mr. Chapman stated.

Does that tend to alter your opinion given in that report?—Not in the least.

Were you in the room when Mr. Chapman described the means he was using to ascertain the strength of the tenth pier?—I was.

Do you think it possible, by those means, to ascertain the strength of it?—I think that those means might strengthen the opinion given in the report, as far as relates to the probability of its carrying a new arch; but I think a great deal more would be necessary, for the purpose of ascertaining its security, as to the proposed alterations.

Do you think it is possible correctly to ascertain the strength of the piers, without sinking coffre dams?—I should think not, if the responsibility of the alteration was to remain with me.

If you had sunk a coffre dam, and examined one of the piers, and found that strong enough to bear the supposed alteration of the bridge, should you be content with that examination, without examining the other piers?—Certainly not.

Would you like to contract for the alterations of the bridge, at the proposed sum of money, taking upon yourself the alteration of the bridge, without including the expense of sinking of coffre dams?—Certainly not.

You have estimated the expense of the alteration at 92,000*l.* not including any examination of the strength of the piers?—Yes.

Either for coffre dams or otherwise?—Yes.

Did you hear the opinion of Mr. Rennie, that each coffre dam would cost 18,000*l.*?—I did.

Do you agree?—I apprehend it would cost a great deal of money; but not having constructed one myself, I cannot speak so correctly to it as Mr. Rennie.

In the expense of 92,000*l.* have you included the expense of stairs at each end, and at the sides of the bridge?—No.

Can you state what additional expense that would entail on the alteration?—No, I have not made any estimate; it would be considerable.

In the estimate of 430,000*l.* for a new bridge, have you included the expense of stairs at each end and side?—They are included.

Have you made an examination, which leads you to form an opinion, as to the mode in which the piers were originally built?—No.

Have you been able to ascertain, whether the piers were constructed all at once, or additions made since they were originally built?—They appear to have had additions made to them since the original construction of the bridge.

On each side?—Yes.

Would you consider a pier, built in three parts, as you describe these to be, as strong as if constructed of the same dimensions at once?—No.

Are you enabled now to discover the heads of the piles on which the piers are founded?—I have not seen them.

Have you seen the pier since the excavation was made, spoken of by Mr. Chapman?—No.

Should you think, that an excavation into one of those piers of three feet, would enable any person to form such an opinion of the stability of the piers, as to speak confidently upon it?—I should not be satisfied with it, as relates to myself.

Do you think that the starlings of the present bridge could be considerably reduced without endangering the safety of the bridge?—I think it would be an operation of great hazard.

If from opening the additional arches of the present bridge, and owing to the flux and reflux of the tide, the bed of the river were to be considerably deepened, would that endanger the safety of the altered bridge?—I do not feel that I can speak so correctly to that point, as the engineers; I would rather decline answering it.

In the estimate of the 92,000*l.* for the alteration, was there any calculation for the taking down of one or more houses for the approach, either for a temporary or the repaired bridge?—No.

No estimate whatever of that?—No.

Was there any estimate in the 430,000*l.* for the taking down any houses?—No.

You heard Mr. Rennie's evidence as to the probable number of houses that would be necessary to be taken down?—Yes.

That for a temporary bridge one house must be taken down at each end?—Yes.

Have you any idea of what would be the expense of those two houses?—I

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(17 April.)

presume Mr. Rennie made the statement of the houses to be removed, assuming a situation for the site of the bridge, which not being acquainted with, I cannot tell what number of houses would be required.

You will be able to report, perhaps, to the Committee, by a communication with Mr. Rennie, what would be the probable number of houses necessary to be taken down to raise the road-way, in case of a new bridge being erected, or the proposed alteration adopted, on some other day?—Yes, I could.

You know that Mr. Rennie has stated the necessity of raising the ground on the London side nine inches, and on the other side, opposite Tooley-street, three feet six?—Yes.

You will deliver it in writing?—I will have an immediate communication with him on the subject.

In the answer you have given respecting the pier, you have answered as a surveyor, not as an engineer; do you consider yourself competent to answer it in the manner in which it has been done by Mr. Rennie or Mr. Chapman?—Certainly not with the same confidence; I have only spoken, with respect to the pier, as far as my own feelings go, and the steps I should take for myself, in operating such a concern.

Do you think you can speak decisively as to the effect of the present examination into the soundness of the piers, until the examination at least of one of them has been completed?—Speaking for myself, and the responsibility I must take, if I had such a work to execute, no examination that is taking place in the pier, in the manner it is now doing, would be satisfactory to me.

Have you made any estimate of the probable expense of the coffer dams?—None.

If the centre arch of the new bridge be as high as that at Southwark bridge, to what point would the arches extend, north and south?—That will depend upon the rise that is given to the road, because the less the rise, the greater of course will be the extent to which it will be carried.

Have you had any experience in building and repairing bridges?—I never have built any; with respect to repair, as far as relates to my general situation, of clerk of the city's works, the repair of London bridge comes occasionally before me.

You were asked, whether you are a judge equal to those engineers, and enabled to speak positively as to the power of carrying such weight; do you form your judgment upon the experiments necessary to be tried upon the soundness of the pier, as if you were about to throw a very considerable weight, as building a warehouse, for instance, on an old foundation?—I should certainly bow with great deference to the opinions of engineers upon the subject; but the result of my opinion, with respect to those piers, is from the practice I have had as a surveyor, and the necessity of taking care that the foundations are good.

Have you had any experience in laying foundations under water?—No, I have not had much.

Then the estimate of 92,000*l.* is formed on the idea that the piers should be found in a sound state?—Yes.

If any one should be found in a defective state, would not it add very considerably to the expense?—Yes, certainly.

And of course, if more than one, a still greater expense will be incurred?—Certainly.

Have you formed any estimate of what would be the expense of building a new pier after the operation had begun?—No, I have not.

So that the first arch might be supported, the two piers being found sound, and then finding the others unsound, that would add very much to the amount of the estimate?—Yes.

You stated yourself to be clerk of the city works?—Yes, and their surveyor and architect.

Is there a separate appointment for the other works?—There is an appointment of superintendent of London bridge, who is my brother, but the principal business devolves upon me, as the superior officer.

As a professional man, do you think you would be enabled to make contracts with responsible persons, who would take all the risk upon themselves, to do the proposed alterations for 92,000*l.*?—I really do not know how to answer that question.

Would you enter into such a contract yourself?—No.

Supposing the centre arch to be the height of that proposed in the report, and the bridge be made according to that report, can you state to the Committee where the approaches would begin, north and south?—At Thames-street and Tooley-street.

At

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At what distance, as alluding to the quantity of houses it might interfere with?—I have before stated, that I am not able to answer that.

In the estimate of 430,000 *l.* for building the new bridge, are you enabled to state, from the best opinion you can give, of your own calculation on the subject, that a contract might be made to build that new bridge at the price which you, the surveyors, have put it at?—I have no doubt about it.

Then at the present price of the materials, you think a person would undertake to complete a bridge at 430,000 *l.*?—I do.

Does that include the expense of removing the old bridge?—There has been no estimate made of removing the old bridge; but it has been conceived, that the materials would pay for the labour.

Is the paving of the bridge included in the estimate?—Yes, it is.

Which do you consider as the best site for the proposed new bridge; would you recommend it to be erected on the present, or to be removed to any other?—I should recommend it to be built on the present site, to make the least possible destruction of property by the approaches.

Then your estimate is formed on the supposition of its being erected on the present site?—Yes; being erected on the present site, or in a situation of the width of waterway of the present bridge; the estimate is confined entirely to the bridge, as no estimate could be formed till the site was fixed upon.

The Committee suppose, if another site were resolved upon, the expenses of the approaches would be very considerable?—Certainly.

### *James Mountague, Esquire,*

Called; and Examined by the Committee.

James Mountague, Esq.

You are surveyor to the committee for improving the port of London?—Yes.

You signed the report of the 12th of March, together with Mr. William Mountague, Mr. Rennie, and Mr. Chapman?—Yes, I did.

Has any thing occurred since, which would lead you to alter your opinion given in that report?—Not any thing.

You have heard the evidence given by Mr. William Mountague?—Yes.

And the different questions proposed, and answered by him?—Yes.

Do you differ in opinion from any of those answers which have been given by him?—No, I do not.

Then, having heard the evidence that has been given, are you of opinion, that if the new bridge, as represented in the plan, should rise at Tooley-street, and extending to Thames-street, it will, or will not, be steeper than at Blackfriars bridge?—I cannot give a satisfactory answer to the question; it was agreed that the rise should not exceed an inch and a half in a yard; but I have made no comparison with the other bridges.

Do you know what is the present annual expense of the repairs of the bridge?—I think, upon an average of twenty years, about 3,500 *l.* per annum.

What has been the expense within the last year or two?—In 1818, the expense was 3,509 *l.* and 1817, 3,340 *l.*; the whole period, from 1801 to 1818, both inclusive, produces an average of 3,438 *l.* 14 *s.* 3 *d.* which I call 3,500 *l.*

Supposing the alteration to take place in the opening of these arches, as contemplated in the report, what do you suppose will be the probable annual expense incurred?—It cannot be spoken to with accuracy; but I should concur with Mr. Chapman, that it would be about one half to two thirds of what it has been formerly.

Of the actual starlings which are repaired, what proportion would be removed by the proposed alteration?—Four starlings and piers would be removed by the proposed alteration of 1814.

Out of how many?—There are eighteen piers and starlings, but the whole of them are not repaired at the expense of the Bridge House; those used by the water works on the London and Surrey sides, are repaired by the company, as far as they are occupied by them; the other parts are repaired at the expense of the Bridge House estates.

How many are there of them?—There are thirteen entire starlings, kept in repair at the sole cost of the Bridge House estates, and the extremities of five starlings.

Are those five occupied now by the water works?—Yes; five locks or waterways on the north shore, and two on the south shore.

But

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James Mountague, Esq. (17 April.)

But your plan of alteration proceeds upon the supposition that the water works are to be removed; and, consequently, that those seven starlings, of which you now only repair a part, will be entirely to be repaired by the Bridge House estate?—Yes, certainly; the whole of the starlings which remain, when the water works are removed, will be to be repaired at the expense of the Bridge House.

*William Lewis Newman, Esquire,*

Called; and Examined by the Committee.

W. L. Newman, Esq.

You are city solicitor?—Yes.

A petition was presented, I believe you are aware, from the inhabitants of the borough of Southwark, praying that they would establish a magisterial jurisdiction within the borough?—Yes.

Were you consulted with, on the part of the corporation, on that subject?—Yes, I was consulted by one of the committees of the corporation, the committee for general purposes, on the subject, and made a report in writing to the committee.

You have been professionally engaged in drawing up a case, to be submitted to counsel?—No; the case was drawn by the bridge comptroller, on the part of the Bridge House lands committee, and sent to me to peruse and make any observations upon it.

Are you of opinion, that the estates, which are commonly denominated the Bridge House estates, situated in St. George's fields, are and may be legally used for the support and maintenance of a magisterial jurisdiction in the borough of Southwark?—I still retain the opinion which I offered to the committee in my report, and in the observations which I submitted on the draft of the case, on that subject, which was, that I thought that estate, which was purchased of King Edward the Sixth, was an estate which belonged to the city of London, and not to the Bridge House; there were several reasons which led me to form that opinion; in the first place, the purchase was made for the use of the city, without any trust or limitation; in the next place, there were certain quit rents, which were payable out of the Bridge House estates, which were part of the purchase; and that, although there was an order of the court of aldermen upon the bridge masters, to pay the purchase money, yet there was afterwards an order to discharge the bridge masters in their accounts for that sum; that there were sources arising from monies belonging to the city, in the hands of the bridge masters, which clearly did not belong to the Bridge House, and which might have been applied in payment of the purchase money; that the city had no magisterial jurisdiction in Southwark, till the charter of Edward the Sixth; that they purchased duties, as well as lands; that they had the offices of coroner, of justices of peace, and the bailiwick, and the duties belonging to those offices, when those lands and the bailiwick were in the possession of the archbishop of Canterbury; and at former periods were, as I apprehend, executed by those former possessors, who had the privileges of infangtheft within their liberty, the bailiwick, and the office of coroner; to all which a gaol was incident.

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*Jovis, 19° die Aprilis,* 1821.

## MR. ALDERMAN WOOD,

IN THE CHAIR.

*William Lewis Newman, Esquire,*

Called; and further Examined.

W. L. Newman, Esq. (19 April.)

HAVE you any additional evidence to add to what you gave at the last meeting of the Committee?—In addition to the observations I made then, I wish to state the reasons which have induced me to form the opinion I have upon the subject; that if there had been no gaol antecedent to the date of the charter, yet a gaol would have been incident to the offices and jurisdiction thereby granted to the city. In my observations upon the draft of the case, I objected to its being made a question, whether those lands were absolutely vested in the city for its own use, or held in trust for the support of London bridge, not deeming it necessary to raise that question, as between the city and the bridge house; and, because being persuaded in my own mind, that the city held those lands in fee, not subject to any such trust, I thought the city's right ought not to be questioned, otherwise than in a due course

of

W. L. Newman, Esq. (19 April.)

of judicial inquiry, and therefore suggested, that the question should rather be, whether the profits of those lands, to whomever they did belong, were, upon the facts to be stated in the case, liable to defray the expenses of the magisterial jurisdiction, and the maintenance of the gaol. I do not consider the corporation to have abandoned their claim to these lands, or mean to concede the city's right therein to the Bridge House, but that the question remains open for discussion in a court of law, whenever the corporation shall deem it expedient to obtain a legal decision upon the subject. I have always deprecated any contest taking place between the city and Bridge House, respecting the title to these lands. I consider the proceedings in the court of common council, on the report of the Bridge House committee, after that committee had obtained the opinions of counsel, in the nature of a compromise for the time, and not as a decision between the city and Bridge House, in respect to which of them the lands actually belong, or that the city were thereby bound to relinquish the rights claimed.

*Robert Finch Newman, Esquire,*

Called; and further Examined.

R. F. Newman, Esq.

Be pleased to show to the Committee the present state of your receipt upon the property belonging to the bridge?—The amount of the rental for the year 1820 is 25,805*l.* 13*s.* 2*d.*

From what does it arise; what is the nature of the property?—It consists of rents received in respect of the estates called the Bridge House estates.

Are they houses?—Houses, lands, and wharfs.

Are there any farms?—There is one farm.

What does that farm let for?—I think 200*l.* a year.

Upon lease?—Yes.

For what time?—Twenty-one years.

Can you speak as to the probable future rental, whether the rent will be more or less in any given number of years?—I cannot.

Is the present rental such as has been received for some years past?—The rental of the present year is more than any preceding year.

By any large amount?—By about 1,800*l.*; I should state, that it is owing principally to one rent, which has been increased 1,000*l.* a year.

Was that a wharf?—Yes.

Let to Government?—To a private individual.

On a long lease?—Twenty-one years from about this time.

Is any part of this property that which the city solicitor has considered applicable to the magistracy of the borough of Southwark?—It is.

Can you state to the Committee to what amount the rental is which he considers so applicable?—I cannot precisely, inasmuch as there is property in St. George's fields, belonging to the Bridge House, which is not part of the estates alluded to, and the rental of the whole is mixed up together; the property conveyed by the charter in question, consisted of slips of land in various parts of the field; it was then an open field; there would be very great difficulty in distinguishing with precision, those parts comprized in the charter from the other parts.

Was the whole of the property slips of land to which you allude?—I can produce a plan of the estates in St. George's fields.

Which will show the whole of the property that you consider applicable for that purpose?—Yes; combined with the other property I have alluded to.

Can you give the Committee a rough estimate of the supposed value?—I should suppose the estates in St. George's fields produce an income at this time of about 7,000*l.* a year.

Has the solicitor ever stated any amount to which he so claimed?—Not that I am aware of.

Is the whole of that 7,000*l.* a year a grant under the charter to which he alludes?—I before stated, that the estates conveyed by the charter and the other estates are mixed up, and I cannot separate the one from the other; I can produce a plan of the ground before the houses were built, and also a subsequent plan; the last plan was taken in 1810.

What other income have you?—Dividends upon stock, and interest on cash, amounting to 4,011*l.* 11*s.* 8*d.*; and a sum of 300*l.* 19*s.* for casual receipts, which are not of a permanent nature.

Have you given the Committee the whole of your income in the last year?—I have.

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*R. F. Newman, Esq.* (19 April.)

Be pleased to state how much is owing to you in debt at this time, and from whom?—There is the sum of 36,383*l.* 4*s.* 6*d.* cash, owing by the city.

Upon which the city pays five per cent?—Yes.

Any other debt?—The sum of 9,000*l.* three per cent consols also, owing by the city, for which the city pay the dividends to the Bridge House; they consider it a debt due from them to the Bridge House; they have recently replaced the sum of 6,000*l.* stock, which now leaves 9,000*l.* stock before stated.

What other cash?—There is nothing else owing to the Bridge House. There is a capital of 54,000*l.* four per cents; they have also 17,257*l.* 1*s.* 6*d.* three per cents; and 3,860*l.* 12*s.* 6*d.* three per cents; the latter sum is in the hands of the accountant general of the court of chancery, for the purpose of being reinvested in the purchase of freehold property; it is the produce of freehold property sold under an act of Parliament; there is also in the hands of the accountant general of the court of chancery, the sum of 850*l.* 17*s.* 1*d.* exchequer bills, and cash, also to be laid out in the purchase of freehold property; and there is a balance of cash in the hands of the chamberlain, as banker to the Bridge House estates, and in the hands of the bridge masters, amounting to about 4,200*l.*

The Bridge House have not always been in possession of such large balances till lately?—Only lately, in consequence of the rental having very much increased in the last few years.

Have they ever been so much in want of money at any time, that the city have lent the Bridge House Estate money?—It does appear in former times, that the city have occasionally assisted the Bridge House funds with loans; it also appears, that when the enlargement of the bridge took place, and the centre arch was made, that the city paid the sum of 3,000*l.* towards the expenses, out of their own funds.

Did they give it as a present?—I conceive so, from the entries that appear.

What grants have Parliament made for the alteration and repairing the bridge, from time to time?—At the period I have before alluded to, when the bridge was enlarged, and the centre arch made, it appears, various grants were made by Parliament to the extent of 75,000*l.*

Having given the Committee the income, have the goodness to furnish the Committee with the expenditure and the items?—An account has been made out by the direction of the Bridge House committee of the various charges upon the estate, by which it appears that the permanent charges (some of which vary in each year,) upon the average of six years, amount to 5,683*l.* 19*s.* 7*d.* per annum; they consist of rents, quit rents, charges made upon the estates by acts of Parliament, an annual charge of repairing certain roads at Stratford, antient customary payments, tithes, taxes, poor and other rates, watching and lighting the bridge and bridge yard, repairs, stationery, printing, law charges, stamps, expenses of management and other incidents of office; in the before-mentioned average, the charges attendant upon the repairs of the bridge are excluded; there has been upon the like average of six years, an annual sum of 5,887*l.* 12*s.* 2*d.* for casual payments, consisting of the expenses of draining, paving and improving the estates, purchasing land and houses contiguous to the Bridge House property, building wharf walls to the Bridge yard and Cotton's wharf, rebuilding party walls, commission on receiving rents in St. George's fields, reducing a shoal near the bridge, watching and lighting vacant ground and houses in St. George's fields and Moorfields, to prevent depredations. I should state, that I conceive there has been more expended within the last six years, on this account, than can be fairly calculated on, in future, probably 2,000*l.* a year may be the extent of the future disbursements for casualties.

Two thousand pounds you calculate may be the casual payments; will not such payments, if incurred, be probably productive of an increased revenue to the estate? —Yes, ultimately, to a certain extent; there is another annual sum of 112*l.* 1*s.* 4*d.* for the maintenance of poor persons who have gained settlements on the bridge, and annuities to one or two individuals; this sum is gradually diminishing.

Be good enough to explain the nature of these last charges, the settlements and so on?—It was a provision made by the act of Parliament, for widening and improving London bridge, the 29 Geo. II, c. 40.

That was the Act for removing the houses from the bridge?—Yes, that Act charges the Bridge House funds with the support of the poor persons who had gained their settlements on London bridge.

How many of them survive?—I believe three or four.

The Committee observe in the brief statement, pensions and allowances, on the average of five years, amounting to 264*l.*; be kind enough to state under what

circumstances

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R. F. Newman, Esq. (19 April.)

circumstances they were granted to the parties?—The two first, Amelia Marryat and Frances Elizabeth Yeoward, are relatives of bridge masters who died in distressed circumstances; Hannah Brindal is the widow of a labourer who was in the service of the bridge house; George Hill was entitled to the receipt of certain tolls formerly payable at the bridge yard; it was deemed beneficial to the Bridge House estates that the tolls should be abolished, and he surrendered his rights upon having an annuity of 130*l.* secured to him for life; he is now dead.

Letitia Cook?—Is an annuity charged upon an estate in Tooley-street, belonging to the bridge house.

How is that charged?—By deed; the property descended to the city, subject to that charge, which had been made by a person formerly possessed of the estate.

Is she dead?—No: It is a permanent charge.

To her and her heirs?—Yes.

Jane Barrow; what is that?—She is the widow of a labourer who lost his life in the service of the Bridge House.

Cox, Griffin and Co. an allowance out of their rent; what is that?—For part of the premises they held being taken from them for other purposes.

All those statements are included in the 5,683*l.*?—Those that are of a permanent nature are included in it.

What is the total amount of the expenditure in charges for the management of the Bridge House estate?—Upon the average it is 2,634*l.* 18*s.* 6*d.* per annum; that excludes the commission of the collector of rents from tenants at will in St. George's fields, which is not a permanent charge, and diminishes annually.

In what manner is the business of the Bridge House conducted?—The whole of the business is managed under the superintendence of a committee of the corporation; with respect to their mode of letting premises, if an application be made for renewing a lease about to expire, the committee view the premises, their surveyor then surveys them, and reports his opinion on the value, and the best mode of letting; if the committee agree with the tenant, they report it to the court of common council for their sanction; if they cannot agree with the tenant, and in all cases where there are no tenants in possession, the premises are put up for letting by public auction, and all treaties, excepting where the letting takes place by public auction, are submitted to the approbation of the court of common council; no works of any importance or large disbursements are undertaken or made by the committee, without the previous sanction of the court of common council; and no bills which exceed 100*l.* are paid by the committee, without the same sanction. A brief statement of the accounts is annually made out and laid before the court of common council; it is then printed, and a copy sent to every member of the court; the accounts are subsequently audited by four individuals, elected by the livery of London, who are not members of the court of common council; they carefully examine the accounts and vouchers, and report the result to the livery; the accounts are then sworn to by the bridge masters, one copy is deposited in the chamber of London, and the other at the Bridge House. The duties of bridge master have been already detailed, as also the duties of clerk of the works.

Did the inquiries made with respect to the application of the proceeds of the estates in St. George's fields, towards the expenses of the Southwark magistracy, arise from any public notice being taken of the subject, or otherwise?—Certainly not from any public notice; the inquiry was commenced by the Bridge House committee, in consequence of the representations that were made to them by the late Bridge House comptroller, Mr. Samuel Newman; he entertained the idea, that the estates in question were not liable to those expenses, and considered it therefore his duty to bring the subject under the consideration of the committee.

### *William Mountague, Esquire,*

Again Called; and further Examined.

W. Mountague, Esq.

Mr. Newman having stated the income arising from houses, lands and wharfs, to be 25,805*l.*; can you inform the Committee whether that is likely to be the income for any number of years to come from that particular source?—I think it is very probable that it will be an increasing income.

Give the reasons for that opinion?—Because in about seven years there will be several properties fall into the hands of the Bridge House committee, that are at present let on building leases, and will of course produce improved rents.

Are there at present vacant pieces of land to let in St. George's fields, or else-

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*W. Mountague, Esq.* (19 April.)

where?—There are several pieces of land to let in St. George's fields; but in proportion as the improvements are going on there, it becomes necessary to take down property which is at present paying an improved rent, and therefore, as relating to that estate, I do not calculate much immediate improvement in the receipts.

What term do you let your estates for?—For building leases, sixty-one years.

In your opinion, will the property improve in seven or fourteen years to any amount above the present income, that you can speculate upon?—There is one estate will fall in, consisting of Hercules-row and the Asylum, the lease of which expires in about five years, and for which at present only 20*l.* per annum is received; this will produce a considerable improvement of rental, but to what extent I cannot state, without an inspection of the property.

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*Mercurii, 2° die Maii,* 1821.

## MR. ALDERMAN WOOD,

IN THE CHAIR.

*James Walker, Esq.*

Called; (Examined by Mr. Randle Jackson.)

*James Walker, Esq.* (2 May.)

YOU are an engineer by profession?—I am.

I believe that you had the building of a material part of Vauxhall bridge?—Yes, of the whole of the bridge, as it is now erected, excepting the foundation of one of the abutments.

You have been called upon to examine the foundation of London bridge very recently?—I have.

Is this a report of your observations? [*handing a paper to the witness.*]—It is; if it contains any inaccuracies in the dimensions, or in the copying, I beg the shortness of time may be my apology for them.

[*It was delivered in and read, as follows:*]

"Gentlemen,

"The first question proposed by you, on behalf of the corporation of London, to me, relates to the capability of the present foundation of London bridge; to bear the new arches proposed by Mr. Dance and others. By the foundation, I understand to be meant, not only the ground under the pier, but the part of the pier itself which is under the regular courses of masonry, and under low water mark. And my reply to the question is, That I have no hesitation in giving it as my opinion, that so long as the starlings or casings round the piers are supported, the foundations are amply sufficient to support the weight of the proposed arches.

"It may be proper, that I state shortly the premises which appear to me to justify this conclusion.

"First.—From an aperture made in the north side of the pier, between the great lock and long entry lock, and in the starling round it, I have been enabled to examine very accurately the foundation of that pier, so low as three feet under the low water mark of ordinary spring tides. This aperture was made eight feet horizontally into the body of the pier, or one-third of its whole thickness; it was six feet in height, and about five feet in width. The bottom of the original regular masonry of this pier is nearly two feet above low water mark; the first course is laid upon an oak sill sixteen inches wide and nine inches thick, which probably goes round the pier. All below this, including the starling, is a mass of Kentish rubble, or other equally durable stone, mixed with flint and some chalk, which is not well cemented; but, above this level, the mortar is good and the work well bound together. No piles or other timber of consequence, excepting the sill above-mentioned, have been found under this original pier. The stone work of the lower part of the pier appears to have been new fronted at some period subsequent to the original building of the bridge. As the base of this new front projects about ten inches before the old pier, piles, four to five feet long, have been driven into the rubble stone work of the starling, to support another sill upon which the footing of the new stone front rests; this new facing is bonded into the old pier, and is now in good condition. The stone work of the foundation of the up-stream addition, which was made to widen the bridge, does not go so low as the original foundation by about fourteen inches.

James Walker, Esq. (2 May.)

inches. There is no sill under this part, but the courses of stone rest upon the tops of piles four to five feet long, driven as those above into the rubble stone work. The courses of stone work of this part are very straight and regular, which is rather unusual with work done at different times and in different ways; it is bonded into the old work, and proves, so far as this pier goes, a perfect capability of the foundation, and that little of the bearing of the pier depends upon the timber work under it; the original oak sill is, however, as perfect as if it had been laid but yesterday; the outsides of the piles under the more modern work, for about an inch deep, are decayed, but within they also are sound. The starling, opposite the part of the pier where the aperture has been made, is five feet six inches from the pier, and is formed of an outside row of large piles driven close together, and stated to be of great length. These are bolted to a strong sill inside of them, and there are other large piles at short distances from each other, upon the tops of which, and upon the cap sill, which goes over the principal or outer row of piles, pieces of timber are bolted, which are tied also to the stone work of the pier. I have prepared a section of the pier, which will render this description more intelligible, and to which I beg to refer you. From it, and from what I have described, I think there is little doubt, but that, in forming the pier originally, the first operation was to drive the external close row of piles, which still form the outside casing of the starlings, then, probably, to clear out the loose gravel from within the dam or inclosure so formed, then to fill the whole area within with stone, flints, &c. and upon this reaching above low water mark, to proceed with the regular building of the pier. I have been thus particular in describing the nature of the work of this pier, both because it differs from all the accounts I have seen, as they state the piers to rest upon a close body of piles with their heads above low water, whereas it turns out in this pier, that there are no piles under the original foundation; and because this general outline of the construction of the pier will show how necessary the external casing of the piles is to its security; for, although the rubble stone work is sufficient to support almost any perpendicular weight, the pieces are not so bound or cemented as at all to insure its stability, if deprived of the protection afforded by the external piles of the starling, to the work which is below the regular masonry; these piles thus forming an essential part of the pier, and keeping the comparatively loose rubble work which is under low water, together.

"Secondly.—I think the sufficiency of the foundations under the piers, proved by this, that notwithstanding the great age of the piers, and the many additions and alterations that appear to have been made in different ages upon the piers and arches, there are but few marks of failure, arising from the settlement of the foundations; and the defects that have taken place, appear to me to have been caused more by the starlings having, at some former period, been neglected, and the rubble work of the pier being thus exposed to the action of the water, than to any other cause. This is the case at present with the two piers next the sixteenth lock, of which the regular stone work, at the upper shoulders of the piers, is bare, and the piles and sleepers in front of the foundations are exposed. The weight and motion of the pumps of the water works, which rest upon the starlings, have probably contributed also to the partial sinking at the ends of the starlings, upon which they rest.

"Thirdly.—Although the proposed arches are to be of much greater span than the present ones, yet if the spandrils, or spaces between the arch stones and the Roadway of the present small arches, are filled in solid, which I understand to be the case, the new arches may be constructed so as not to throw much, if any, more weight upon the piers than the present ones do.

"Fourthly.—A principal cause of danger to the safety of the piers, as well as the expense of defending them, at present arises from the very great current of the water through them, which causes, towards the latter end of the ebb tide, a difference of level of five feet in the surface of the water, between the upper and lower ends of the pier, and sometimes considerably more; but when the proposed alteration is made, I find, by calculation, that this five feet will be reduced down to three inches, and the velocity of the current will be about one-fifth of the present velocity. It is almost unnecessary to state, that this will add very materially to the security of the foundations of the piers, and that having with repairs, withstood the action of so great a fall and velocity for about seven hundred years, they will be comparatively at ease under what will be so much less.

"Fifthly.—The two piers which support the present great arch, tend to confirm generally the opinion of the capability of the piers, there being no appearance of any weakness

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*James Walker, Esq.* (2 May.)

weakness shewn in them; and the proposed arches may certainly be constructed so as not to be heavier than the present great arch, although the span of two of them is from five to ten feet greater.

" Sixthly.—Presuming that the rubble work of the present piers goes down to the regular bed of the river, of which I think there can be but little doubt, my experience of the strength of the subsoil, from having superintended the erection of Vauxhall bridge, and from having been employed upon other works upon and near the river, would, without any of the preceding reasons, have led me to conclude, that piers resting upon so large a surface of ground as those of London bridge do, are amply sufficient, in point of vertical strength, to support the proposed arches, or arches of a much greater span.

" Seventhly.—The arches of Vauxhall bridge are all of nearly the same span as the greatest of the proposed arches, but being of iron, they are much lighter than what were proposed by Messrs. Dance and others for London bridge: but Westminster bridge is more in point; its centre arch is, I think, 76 feet; there are no piles under the piers, and the bases of them are all less than those of London bridge.

" The next question submitted to me, is as to the means of making a sufficient examination of the piers, upon which the proposed arches would be erected. In reply to which, I beg to say, that no more effectual way could have been adopted for examining the pier in which the aperture has been made, than has been done in this case, unless a coffre dam were formed round it, which would have been attended with enormous expense, and which could not be safely done without taking down the arch on each side of the pier, and endangering the safety of the foundations; and if the same process should be thought necessary to each pier, it would amount, in fact, to nearly taking down the bridge. Had the result of the examination which has just taken place, coincided with the previous accounts of the mode in which the piers were said to be built, I should have thought any further examination in the present stage almost unnecessary; but as the foundation is so different from what was expected, it would certainly be more satisfactory to examine more of the piers in the same way, and the expense of doing it would not be considerable, as I do not think it would be necessary to go lower than low water mark with the other piers, if the work down to that level should appear constructed in the same way as the pier which has been examined; such an examination would, I think, be sufficient, and would, independent of the other reasons to which I have referred, go far to give an accurate opinion of the durability, as well as of the capability, of the foundations.

" The very short time which has been given me for the consideration of this important subject, must plead my apology for any inaccuracies or omissions which may have occurred, which I shall endeavour to detect and correct, if an opportunity is allowed to me for so doing. I am, gentlemen, your very obedient servant.

" 35, Finsbury-square, 1 May 1821. (Signed) " *J. Walker.*

" To Timothy Tyrrell, esq. city remembrancer;
and
R. F. Newman, esq. comptroller of the bridge house estates."

Did others assist you in this examination?—There were others present during the examination.

*Committee.*—Do you not consider the formation of a coffre dam as a more perfect mode of examining the pier, and one on which you would rather rely, than the one you have resorted to?—My answer to that is, that it is a more perfect way, certainly.

How many of the existing piers are intended to carry the projected arches?—There are four intended additional arches.

And how many of the existing piers are they intended to rest upon?—Six altogether.

*Mr. R. Jackson.*—Pursuing the course you have now done, you think you could with safety build the arches, which satisfies your own mind it has strength enough for the purposes required?—I should think the foundations are quite strong enough, and I should have no difficulty in erecting the arches proposed, subject to this always, that the starlings are supported.

You think it has strength enough, provided the starlings are kept as they ought to be?—I do.

Does that apply to all the arches?—If the other arches are as strong as the one I have examined; I can only speak positively to one.

Is that mode of examination sufficient to warrant you to throw open the arches, and build on the other piers?—I should be quite satisfied with a similar examination without a coffre dam, it being always understood that the coffre dam is the most effectual way.

*Committee.*—Would you contract for 90,000*l.* to do all that is suggested by the report?—I would not only not contract, if I had estimated it; but I have not estimated it, and cannot say any thing about the cost.

Have you made any calculation as to a new bridge at all?—I have not; I could not answer any question as to expense at present, except from having built Vauxhall bridge, and forming thereby a general idea.

Do you think a person may be found to contract for a new bridge for the sum stated in the report of Mr. Rennie and Mr. Mountague?—I should decline answering the question, not having formed any estimate of it; in fact, I have seen no plan.

Do you know what Vauxhall bridge cost?—I have a pretty accurate knowledge, from having superintended the building of it.

How many feet is the bridge then?—It is 806 feet between the abutments.

What did it cost?—About 109,000*l.*

*Mr. R. Jackson.*—How long will it take to go on with the examination of the other five piers?—I think in the course of a month it might be done completely.

The one you have examined, is one of those you mean to rest upon?—Yes.

Would it be an expensive process?—Oh no, perhaps it would cost altogether 100*l.* or less.

No greater expense than 100*l.*?—I think not; I allude, in saying 100*l.* to the labour of doing it; because, if there are a number of professional men coming there, their fees will form an addition.

Have you another report concerning the navigation?—I have.

What does that report purport to be?—It is a report which has been prepared, respecting the effect of the alteration of the bridge upon the navigation above bridge.

Prepared by whom?—Mr. Leach and myself; I may say of that as of the other, that it has been done rather in haste.

Mr. Leach is superintendent of all the improvements made in the navigation of the Thames?—Yes, from the city stone at Staines downwards, to the bridge.

[*It was delivered in and read, as follows:*]

" To the worshipful Select Committee for letting the Bridge House Estates.

" Gentlemen,

" Having, in compliance with the directions we have received from the city remembrancer, considered the question, as to how far the navigation of the river Thames, above London bridge, will be affected by the erection of four additional large arches, as proposed by Mr. Dance and others in 1814, or by any equal removal of the pen formed by the present piers and starlings of London bridge, we beg to report our opinion as follows:—

" From the recent, and we believe accurate surveys that have been made, it appears that the difference of level in the water above and below bridge, towards the latter end of the ebb of a spring tide, is from four feet four inches to five feet seven inches; the water is therefore at present dammed up to that extent at the bridge; we find, by calculation, that this pen will be reduced from, say five feet, to about three inches by the proposed alterations; and the water above bridge at low water, will therefore be four feet nine inches lower than at present. But as the velocity of the stream above bridge will be increased by a greater quantity of water having to run through in the same time, both on account of the water flowing higher at high water, and ebbing lower at low water, the inclination of the surface will also be increased; and this lowering of four feet nine inches above referred to, will decrease as the distance from the bridge increases. Now, by the survey above referred to, the present rise in the surface of the water from London bridge to Westminster bridge, at low water, is twelve inches, being six inches per mile; and supposing the velocity, after the alterations, to be increased so as to produce twice the inclination, or twelve inches per mile, the surface of the water at Westminster bridge will be lowered at low water, four feet nine inches, less one foot (the increase of fall) or three feet nine inches below its present level at spring tides.

" Again, from the best information we can collect, the rise of surface from Westminster to Fulham is about eight inches per mile; and as the effect of the alterations of London bridge will be less sensibly felt here than nearer the bridge, we assume that

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that the inclination after the alterations will be twelve inches per mile, and the distance being nearly six miles, the water at Fulham will be lowered at low water three feet nine inches less two feet, or one foot nine inches, which will increase as we descend towards Westminster bridge, when (as before stated) the depression will be three feet nine inches. Again, as at Fulham, the surface will be lowered one foot nine inches; this depression will decrease upwards; but as in any given length upwards, the effect of the proposed alterations will also decrease, this depth (one foot nine inches) will be felt a considerable way up the river, we think it probable that the effect of the alterations may be sensible, in point of the navigation, for six miles above Fulham bridge, or at Kew bridge; and that though it will really extend higher, we apprehend that its effects will not be of any consequence above that point. We believe there is no speculation in any of the above numbers, excepting in the assumed increase of declination of surface, for the correctness of which we cannot vouch; but we have been guided by the consideration, that four feet nine inches at low water, and about nine inches at high water, making together five feet six inches, will be added to the depth of water which will pass through the bridge at every spring tide; and by allowing an increase of fall in proportion to the square of the increase of velocity or quantity, and also by referring to the inclination in the upper part of the river, say between Mortlake and Teddington, as shown upon Mr. Whitworth's survey, and making such allowance as from the difference of situation appeared to us reasonable, we apprehend that we are not far from being correct, particularly between Fulham and London bridge; and it is hardly necessary after the above, to say that we agree in opinion with Mr. Smeaton, that by this reduction of fall at the bridge, "the navigation of that part of the river will be materially affected." It appears to us from our own knowledge, and from the statements that have been given to us, that although the increased velocity of the river would have a tendency to restore the river to its antient depth, and in course of time would probably effect that object, yet that so great a lowering at once would be productive of great temporary inconvenience, unless artificial means were resorted to to deepen the shoals, which, even in the present state of the river, are attended with considerable hindrance to the navigation. Mr. Smeaton's opinion on this subject goes beyond our ideas of time; but as great respect is due to his opinion, we extract it in his own words: "If this difference of bed," that is the difference above and below bridge, "is original, we must expect it to remain after the bridge is taken away; but if an effect, the cause being removed, the river would gradually restore itself; but as this might probably take up seven or eight hundred years (the time it has probably been gathering,) the work of restitution would go on far too slowly to answer the demands of the present generation."

"Our opinion is, that the difference of level in the bottom of the river, above and below bridge, is caused, in a great measure, by the pen of the bridge; and although we think that the work of restitution would be complete in less time than stated by Mr. Smeaton, unless where the accumulation has got cemented into a solid mass, which we have no doubt is in many places the case, yet both for the purposes of present trade, and to prevent the shoals from being moved down the river by the current, and forming obstructions lower down the river, or below bridge, we think that ballasting to a great extent will be expedient and requisite; as, in addition to the above reason, the stuff that is excavated from the upper part may be applied to raise the towing paths and banks, so as to meet the increased height of the high water, which will occasionally be from one to two feet above the present level. One principal shoal is close above London bridge, on the Surrey side; it extends almost half-way across the river, and is even now occasionally above low water. This must therefore be deepened to a considerable extent; and to prevent the opening of any of the proposed widened arches, which will be opposite to it, from washing any part of it into the Pool, and settling upon the shoals below bridge, it, as well as the other shoals, ought to be ballasted away before the proposed arches are opened.

"In regard to the navigation through London bridge, we are of opinion, that it will be very essentially improved by the proposed alterations, and that the cause of the losses, accidents and dangers, to which the passage is at present subject, from the great fall or shoot in the arches, will be almost entirely removed.

"We have mentioned, that the velocity of the current above bridge will be increased. This will take place during both the flood and ebb tide, but will be greatest in the latter; and the increase of velocity will, as before stated, be greatest between Westminster and London bridges. In our calculation of the fall, we have supposed

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supposed, that the increase of velocity will amount to one-half of the present velocity.

"This will, in many cases, be important, not only as regards the velocity itself, (as to which it will sometimes be found of advantage to craft, and sometimes probably otherwise) but as the water will ebb sooner from all the wharfs, the time in each tide, during which the barges are afloat at the wharfs, and when they can float to and from them, will be decreased. This will so far be a disadvantage, but will occur only during the ebb of tide. It is evident, however, that it will not be compensated by the increased velocity of the flood tide bringing the barges sooner to the wharfs above bridge, as the velocity of the flood will not be so much increased as that of the ebb tide; and although barges may come up opposite to the wharfs sooner in the tide than they do at present, if the channel is deep enough, they will not be able to get close to the wharfs until about the same time of tide they do at present, unless a general artificial deepening takes place opposite to each wharf. In some cases, however, barges, which will get opposite to the wharfs early in the tide, will be enabled, by having done so, to draw in to the wharfs so soon as there is depth enough of water to float them in; and so far as this goes, the effect of this proposed alteration will be useful.

"As the new arches are intended to be somewhat higher than the present, masted vessels and sailing barges will not have to lower their masts so much as they do now; but as the arches will not be so high as those of Southwark bridge, which they cannot pass without lowering or striking to a certain extent, the difference between the present and the proposed heights cannot be of any material consequence; and in regard to unmasted or dumb craft, the additional height cannot give any additional facility of moment. We confine this observation to the additional heights, having already said how very much the passage immediately under the bridge will be improved by the additional arches, and the reduction of the pen to comparatively level water.

"We have stated, that the tide of flood will rise higher than at present. By actual observation, it appears, that in ordinary tides, eight inches, and on one occasion, in the month of September 1820, thirteen inches in height of water were kept back by London bridge at high water. This will not be the case after the alteration; and the addition will so far be an improvement to the navigation, by deepening the water, and tending to quicken the velocity of the flood tide; although this increased height of tide will render it necessary to raise the towing paths from Putney to Kew, which are at present barely high enough in the winter season.

"The great cause of shoals is the unequal velocity of current, and this inequality increases as the velocity increases; therefore it is that floods, or great velocities, are always found to add to the shoals of navigable rivers, and to deepen what was too deep before. The increased current through the narrow parts, disturbs, and carries down the materials of the bottom through those narrow parts or *deeps*, and they are lodged upon the shoals below, where the decreased velocity, caused by the widening of the river, has not force enough to carry them along with it. There can be no more striking illustration of this general theory, than the effect of floods upon the river near London bridge, which is invariably to deepen between the arches, and at the same time to raise the shoals below the bridge; therefore, although the natural effect of the increase of current is upon the whole to deepen its channel, it does it so partially, that it has also the effect, in rivers of unequal current, such as the Thames is, of forming and increasing shoals, and unless guarded against by proper means, may therefore be injurious to the navigation. Now, the effect of opening London bridge will be, that the ebb tide and land floods, not being checked by the pen of London bridge, will increase in velocity to the extent up the river that the effects of this pen are felt, and produce the consequences we have mentioned; so that an increase of expense in deepening the shoals after floods, and a greater inequality of level in the bottom, will be the consequence; and this will be a lasting expense, unless means are taken to prevent it. The means we should recommend are, the nearer approximation to an uniform velocity, which would best be accomplished by producing an equality of area, such as contracting the width of the river abreast of the shoals, by means of embankments or otherwise; as this cannot, however, be done in many places to the required extent without enormous expense, ballasting must be had recourse to, until a new regimen, corresponding to the existing circumstances, is obtained.

"Finally, although we think it might have been desirable that the great change which the proposed opening of the arches in London bridge will certainly produce in

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in the navigation, had been made so that their effects might have been felt, and things conformed to the new state by degrees, yet when called upon to give an opinion, without these experiments, we feel little hesitation in saying, that if effectual means are taken for preventing the evils to which we have referred, then the proposed alterations will be beneficial to the navigation above bridge, but that without those effectual means they will be injurious.

"We are, Gentlemen, your obedient servants,
"*J. Walker.*
"London, 1 May 1821." "*Steph<sup>n</sup> Leach.*

This report applies to the proposed alteration of the present bridge?—It does.

Have you made any calculation of the expense of ballasting the shoals?—No, I have no means of making a calculation from my own knowledge; I have therefore left that to Mr. Leach to do.

Your report has no application to a new bridge?—Not to a new bridge; but, of course, as the fall, by the alterations, will be reduced from five feet to three inches, a new bridge would not produce much more effect upon the navigation than the proposed alterations.

### *Stephen Leach, Esq.*

Called; (Examined by Mr. Randle Jackson.)

*Stephen Leach, Esq.*

You are clerk of the works carried on for the improvement of the navigation of the river Thames?—Yes.

You have heard this report read; did you sign it with Mr. Walker?—I did, the report was prepared by us together.

Have you made any calculation of the probable expense of ballasting the shoals to the extent supposed to be necessary?—I have endeavoured to make a calculation; but it is an operation in which there is great difficulty, because it is difficult to ascertain to what extent it will be necessary, in case of the alteration taking place; if the river is lowered three feet at Westminster, it is difficult to say what quantity of stuff must be removed, to produce the same facility of navigation as at present.

To what extent have you carried your calculation?—I have considered that it will be necessary to ballast all the shoals from Putney to Teddington lock, that is, flows as far as the tide flows, and to raise the towing paths with the gravel so taken up from those shoals; the expense of which, I apprehend, would be about 5,000 *l.*; that includes raising the towing paths, which I consider would be necessary in case of the alteration, and which is to be done with the gravel taken from the shoals; with respect to the river below Putney bridge, I find a vast difficulty in making any calculation at all.

Have you made any calculation?—The rough estimate that I have made, amounts to about 20,000 *l.* or some such sum; but whether that is correct or not, I cannot positively say.

Between Putney and London bridge?—Yes.

This is without any certain calculation whatever?—Without any certain data; the fact is, it would be like clearing out a mill pool, which has been some hundreds of years forming, and until the water is drawn off, it is impossible to say what quantity of gravel or other matter it may be necessary to remove.

Do you include the shoals mentioned in the report above the bridge?—Yes, I do.

That would apply either in the proposed alteration, or to a new bridge?—Yes, it would apply to either.

Have you seen the excavation lately made in one of the piers?—Yes, I have.

You have examined it?—Yes.

What is your opinion as to the stability and firmness of the pier as it stands?—I have no doubt of its stability, in case the starlings are kept in a good state; the existence of the pier, in my opinion, depends upon the state of the starlings.

Upon their present dimensions?—Yes.

In that case you regard the foundation as equal to the supposed superstructure?—I do, provided the starlings are kept in the state they are now in.

Will it always be necessary to keep the quantity of rubble there, that there is now?—Whatever is necessary to keep them in the good state, which I consider them to be in at present, will always be so.

Did you examine the foundation, to see whether it rests on piles or solid masonry?—It rests exactly in the way described in Mr. Walker's report; not on piles, but on stone as far as I have seen in that excavation; there are a few piles, but I do not consider

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(2 May.)

consider the pier as resting on them; they appear to have been driven for temporary purposes only.

Is the rubble cemented?—Above low water mark.

Is it below?—No.

Is the stone sufficient of itself, and does it stand so firm and solid as to be competent to support the piers and the bridge?—I have no doubt of it, always considering that it is supported by the starlings.

### *Ralph Walker, Esq.*

Called; (Examined by Mr. Randle Jackson.)

Ralph Walker, Esq.

You are an engineer by profession?—I am.

I need hardly ask you, whether you have been engaged in a succession of public works?—I have for these five or six-and-twenty years, and I may say mostly for these forty years.

Is that your report? [*handing a Paper to the witness.*]—That is my report.

[*It was delivered in and read, as follows:*]

"East India Dock Road, Poplar,
May 2d, 1821.

"Gentlemen,

"In conformity to your request, on behalf of the corporation of London, I have repeatedly viewed, and have attentively examined, the internal part of the pier, between the great lock and the long entry lock at London bridge, by means of the excavation lately made therein, for the purpose of ascertaining its strength and security; and my former opinion of the stability of London bridge piers, has been thereby fully confirmed and established.

"In the year 1796, I attended a view of London bridge with the late Mr. Pitt, and another member of the honourable House of Commons, for improving the port of London, and was induced to make an actual survey of London bridge; when, some of the starlings being under repair, afforded an opportunity of examining, with more certainty, the strength and construction of the piers and starlings.

"I also made some designs for a new bridge, one of which was proposed to be supported by six of the piers of the present bridge, and the waterway to be increased, by removing the other twelve starlings and piers, not necessary to be continued.

"I mention this circumstance, to show the opinion I entertained of the stability of the piers and starlings at that time, and which has been strengthened and confirmed by my recent examination.

"I am, Gentlemen, your very obedient servant,
(Signed) "*Ralph Walker.*

"To T. Tyrrell, esq. city remembrancer;
and
R. F. Newman, esq. comptroller of the bridge house estates."

In the plan then proposed by you, were the starlings to remain as they now are, round those piers that were to remain?—I proposed to reduce the height of the starlings.

How much did you propose?—I do not recollect exactly; the arches were intended to stand upon some of the piers of the present bridge.

Not to reduce their dimensions at all?—No, only to lower them.

You have examined the present piers?—I have examined that pier only, lately opened.

Are you able to speak positively, whether the foundation is of masonry or piles? —At the points of the piers that I saw in 1796, they were supported, for a considerable way in, upon piles; but in the pier that has been under examination it is not supported upon piles, it is upon rubble masonry.

Have you been able to go low enough to ascertain, as a fact, that there are no piles below that masonry?—I do not know that there are any below where we examined; we examined twenty feet nearly below high water mark.

### *James Walker, Esq.*

Re-examined by the Committee.

James Walker, Esq.

What depth of masonry is there in the pier that was under your examination, below low water mark?—I have seen and felt the masonry, from three to four feet under low water mark, but below that I can, of course, conclude as to the nature

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nature of the work only, from supposing the work under the above level to be the same as I have examined, because, I believe that no part of the work was put down by coffre dams.

Do you know what depth of masonry is under low water mark?—I do not know.

Then how do you know the masonry does not stand upon piles?—I have stated in the report, that, as far as I have examined, there are not piles there, but a mass of rubble.

Then you do not mean to state, of your own knowledge, that the pier does not stand upon piles?—Certainly not; I know, that in the part examined, there are no piles of consequence within from three to four feet of low water mark; but beyond that I can only conclude from general reasoning, without examination.

How can you conclude from general reasoning on a thing you have not examined?—The reasoning is this; that in those days, coffre dams were not in use for the purpose of forming bridges; and I conceive, that piles could not, at that time, be driven with the tops to be under low water mark without coffre dams. Every account of the piles, states them to be from two to three feet above low water mark; whereas, from three to four feet under low water mark I find none; and, as I have stated in the report, the regular courses of masonry do not go below low water mark, which they would, I think have done if the water had ever been pumped out for the purpose of driving piles. I therefore think it fair to conclude, that there are no piles under the pier I have examined.

Do you suppose that this has been laid down in a similar manner to the breakwater at Plymouth?—In a much smaller way, but somewhat after the same manner.

Of the foundation so formed, that is your opinion?—That is my opinion.

*To Ralph Walker, Esq.*—Having examined the piers, is it your opinion, that the alteration proposed to be done for 90,000*l.* could be contracted for, for that amount?—I have made no estimate whatever.

Would you not prefer coffre dams to try the experiment of their capability to the plan that has been pursued now?—Certainly not; to put down a coffre dam, to stop up the water ways of the bridge more than they are now, in their contracted state, would be a ready means of bringing down the bridge, by the cataracts that would be formed in the water ways.

Then you would be perfectly satisfied to try the experiment of the alterations without coffre dams?—Certainly, because these piers and starlings have stood upwards of six hundred years, and they do not appear to have settled, and there is no indication of it; and in making any alteration by new arches, the piers could be examined before the work proceeded.

Then you would propose a very large expense to prepare for that alteration, before you could examine them to the extent to which you think it necessary?—I am not aware that there would be any extra expense, beyond the expense of preparing for building the new arches after having examined the piers, and seeing that they are equally sound with that we have examined; that would be an extra expense.

Examined them in what way?—In the way they have been done now.

How does that apply to the case of a new bridge; do you contemplate the building a new bridge on the old piers?—I did do so.

Do you remain of that opinion still?—I do.

Then you pledge your professional reputation, that it would be a better plan to make the alteration on the old piers, than to build a new bridge entirely?—I think it might be made as secure upon the present piers and starlings as the foundation of any new bridge.

Still the starlings to remain?—The starlings to remain, except those under the centre of the new arches, which would be removed.

Would those starlings interrupt the navigation of the river more than a new bridge being built entirely on new piers?—Certainly so far as they extend; since I measured them in 1796, the starlings have been increased in dimensions.

Many of them?—I do not know the number, but I know some have.

Are there more than two?—I cannot say, I know the one that I measured had increased two feet.

You mean by casing them, do you not?—Yes; when the starlings get deranged they put piles on the outside.

That would be an additional encroachment of four feet on the waterway within the lock?—Yes; but that would not be requisite in future, if the bridge was improved.

But

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But according to your view, it would be necessary to continue them at their present existing dimensions?—I have not said that; but I propose they should be of the same dimensions as they are now, but reduced in height.

*Mr. John Kitching,*

Called; (further Examined by the Committee.)

Mr. John Kitching.

Have the dimensions of the starlings of London bridge been increased of late years?—Only of the great arch.

The two starlings of the great arch?—Yes.

In what proportion have they been increased?—The one side was a little more than the other; but I suppose in all from four to five feet each.

Each?—No, both starlings; but that was to make them a more regular sweep than they were before; they were a little flat in the middle.

That the water might run smoother?—Yes.

Was there no other object but that?—I did not hear any other.

None for throwing a greater current to the water works?—No; there were two or three locks stopped up as high as low water-mark, in order to give a greater current to the water works.

In the event of the alteration proposed, whereby these two piers would be wanted to carry arches of a larger dimension, might the starlings be again reduced to their former dimensions with safety to those piers?—Yes, I have not a doubt of it.

Those locks which have been stopped up here, are not where the navigation was?—No; it was too narrow for the navigation.

*Mr. Thomas Piper,*

Called; (Examined by Mr. Randle Jackson.)

Mr. Thomas Piper.

You are the stone mason to the corporation of London?—Yes.

How many years have you been so?—About eighteen years.

How long have you been employed upon London bridge?—The same length of time, eighteen years.

During that period, you have conducted the repair of the bridge?—So far as the masonry is concerned.

Have you attended the examination of the late excavation, in order to ascertain the foundation of the bridge?—I have; the excavation is on the north side of the pier, northward of the great arch, and the bottom of the excavation at the entrance is about nine feet below the level of the starlings, and therefore above low water mark, and on the inside, the depth of it increases three feet; it goes seven feet nine inches into the pier, from the face, and inclines a little to the eastward.

Do you speak as being under the arch?—As it respects the situation east and west of the entrance, it is about twelve or fourteen feet from the upper or west face of the bridge; and it is made at that place, where the bridge has been some time back widened, because the courses of the mason's work do not exactly meet on the spot where the opening is made; to the depth of the entrance, and rather below the pier, consists of rubble mason's work, well grouted or cemented with good lime, and is so hard that it is obliged to be separated with very strong picks and hammers, in the same way as we separate old foundations; below that, although it is, when first opened, as hard as the other, it is not mixed so much with lime; with great violence, we have driven down points and chisels to the depth of one foot eight or nine inches below the bottom of the excavation, (which, I apprehend, is about three feet six below low water mark,) and there it has all the feeling of being as hard as it is where we have made the opening; it appears, that that part of the foundation of the bridge which we call the old part, or the centre, has been built upon a plank or sleeper of oak, which is eighteen or twenty inches wide, and about seven or eight inches thick; it does not appear that there are any piles underneath it, except just at the end, where the opening was made. In the foundation, towards the end of the bridge, there had been some short piles driven to receive large flat stones, which have been substituted where wood was used in the other parts of the foundation. There is, on the entrance, the appearance of planks edgeways, which, I conjecture, were driven down when those short piles were driven, for the purpose of throwing in the foundation, and preventing its being carried away by the tide; for

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Mr. Thomas Piper. (2 May.)

I have very little doubt, but that the depth where we have now dug to, is about where the bed of the river was when London bridge was built.

After eighteen years experience, and this examination, have you or have you not any doubt of the foundation of London bridge supporting the proposed superstructure?—I have no doubt at all upon the subject; and the reason of my feeling confident is, that whatever imperfections or blemishes there may be in the bridge, there is not the least indication of any having arisen from the yielding of the foundation; and I think the experiment which has been made, in turning the present great arch, fully justifies the belief, that the arches that are now proposed to be turned may be so turned with safety; but I am more disposed to think so from the circumstance, that, when the present large arch was turned, for about twelve or thirteen feet in each face of it, it was put upon foundations that had never sustained any such weight; therefore, in turning arches as they are now proposed, we have better means of knowing that the foundation is competent, than they had who turned the present large arch; and I also think, that very little, if any, additional weight will be put upon the piers by making this alteration, because the spandrils will not, as I understand, be filled up solid.

Is that the case now, as to the spandrils?—I believe they are now all filled up solid.

Have you sufficient confidence yourself in the strength of the foundation, to be a contracting party to execute the alteration now proposed at 92,000*l.*?—I have seen no detailed specification or drawings, which would enable me to judge of the correctness of that price, but I have no doubt, that the estimate has been made correctly, and I believe it to be equal to the expense that would be incurred; but it can hardly be expected, that I should say I am prepared to enter into an engagement of that amount, without having more information than I at present possess.

Supposing the 92,000*l.* to be a fair price in itself, would you be deterred from the undertaking from any want of confidence in the foundation?—I am quite satisfied respecting the stability of the foundation, and of its being equal to this undertaking, but my undertaking the responsibility of it, would involve perhaps more than is meant.

You have hitherto examined but one pier; now, if the other pier should be examined, and turn out as satisfactory to you as you state this to have been, then, at a fair price, would you feel sufficient confidence in the foundation to undertake the superstructure?—Yes, I should.

*Committee.*—If you did this work, what time would you undertake it should last?—I never yet heard of such an engagement being entered into in my life; and I think it is very unlikely the city of London would build a bridge on my opinion.

Would you with such a contract, insure that it should stand twelve months?—It is not at all likely that I shall be called on to enter into a contract of that description.

Then in fact, you would not enter into any insurance for the safety of it?—I do not think it would become me to enter into any insurance.

If you were to contract to build a new bridge, would you contract for its standing a hundred years?—I should be sure not to be called on to answer for it, if it did not.

You would have an engineer to superintend you?—Yes.

You would be under a liability to refund, if you built an insecure bridge?—I should expect to have it described, how it was to be done, and to execute it according to the description.

Supposing it to be done according to the best of your judgment, and under your own directions, what is your opinion as to its duration?—I think it quite probable, that it would stand as long as it has already stood.

But you would enter into no assurance for its standing?—I would not undertake to keep it up for five hundred years.

*Mr. Samuel Whitaker*,

Called; (Examined by Mr. Randle Jackson.)

Mr. Samuel Whitaker.

Where do you reside?—At Bingley, in Yorkshire.

I believe yourself and your two partners have been much concerned in bridge building in the north?—We have.

Just state to the Committee what your public works have been?—We have built a considerable number of bridges, perhaps twenty or thirty, or more.

*Committee.*—Tell us any great work?—We have lately finished York bridge.

What

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Mr. *Samuel Whitaker.* (2 May.)

What is the space at York?—The middle arch seventy-five feet, and the two side arches sixty-three or sixty-four feet; we are at present engaged in building an aqueduct over the river Avon, between the counties of Linlithgow and Stirling; it has twelve arches, fifty feet span each; the height from the bottom of the foundation to the battlements, will run from ninety to a hundred feet, some of them more than a hundred feet; we are building one, with some arches fifty feet span.

Where is that?—It is over the river Almond; we are building another over the water of Leith, with eight arches, sixty feet high.

Mr. *Randle Jackson.*—Those are some of the public works?—Yes.

Have you examined the foundation of London bridge?—Yes, we have.

Did you examine the excavation that has lately been made?—Yes, we did.

State to the Committee distinctly, your opinion as to the stability of that foundation?—We consider, that the foundation being so firmly cemented and soldered together with mortar, is quite able to carry any new arch that is intended; we do not suppose the pier to stand upon piles; there is a log of timber, that lies in a horizontal direction, which we suppose was used originally to be the foundation of the pier; and we consider, that if it stood upon piles, that the piles would have commenced there; but the excavation being dug much lower than that, perhaps three or four feet below, no piles appear, which makes us conclude it is not upon piles.

Supposing the other piers to be in as good a state as you find this, are you, or are you not, of opinion that the foundation of London bridge would be equal to the supporting its proposed superstructure?—We think quite sufficient.

Supposing that a fair price was offered you, would you feel confidence enough in that foundation to undertake that superstructure?—We should.

*Committee.*—Would you insure the stability of it for any number of years?—Yes, for a regular time.

What do you call a regular time?—We are in the habit of insuring them for five or seven years.

You would undertake that work, and insure its stability seven years?—Yes, the city of London keeping the starlings in repair.

By insurance do you mean, leaving a portion of the money in hand?—No, we consider that to be the responsibility of our bondsmen; the bonds never run out till that time; we do not leave money in hand; a bond is drawn out, which stands for that time.

You would hold yourself bound in a bond, and leave no part of the money as a security for the performance of it?—No.

Do you believe the opinion you have given, to be the opinion of the persons with whom you are concerned?—It is quite their opinion.

### *Mr. Hiram Craven,*

Called; (Examined by Mr. Randle Jackson.)

Mr. *Hiram Craven.*

You are a partner of the last witness?—I am.

You have heard the evidence given by the last witness; are you of the same opinion?—I am.

*Committee.*—Upon every point?—Upon every point.

Mr. *Randle Jackson.*—And are you agreeable to the same undertakings?—Yes.

You have personally made the same examination?—Yes.

### *Mr. Joseph Nowell,*

Called; (Examined by Mr. Randle Jackson.)

Mr. *Joseph Nowell.*

You are also a partner in this same concern?—Yes.

Have you also examined this excavation?—Yes.

Do you agree in opinion with Mr. Whitaker in the evidence he has given?—Yes.

Are you agreeable to the same undertakings?—Yes.

### *Mr. Peter Davey,*

Called; and Examined by Mr. Randle Jackson.

Mr. *Peter Davey.*

You are in the coal trade?—Yes.

And you have a great many craft passing up and down the river, and through the bridges?—We have.

Have you seen the intended plan of the city of London, for widening the bridge?

—I have

Mr. Peter Davey. (2 May.)

—I have heard a good deal of it, but I never saw it till I saw it on the table this morning.

Having four arches similar to the present centre arch?—I know the plan.

Would those four arches give you sufficient accommodation for your barges, and for your commerce?—I think the proposed alteration would answer the purposes of the coal trade, and therefore I am satisfied; I speak only as to the coal trade.

I believe you are chairman, or at the head of a party of gentlemen in the coal trade; do you speak your own sentiments, or the sentiments of the trade?—I am chairman of a society, called The Owners of Coal Craft, and I believe that my sentiments agree with the sentiments of the generality of the members of that society; I do not say all.

You must know, from being so much upon the Thames as you are, that the coal trade is by far the most considerable that passes up and down the river, and through the bridges?—It is very considerable; I am not a practical man; I am not much in the habit of navigating craft.

You are a petitioner for an increased water-way?—Yes; I believe I may say that the satisfaction of the owners of coal craft; and of the coal trade generally, with regard to the proposed alterations, will depend upon their being done without delay.

Every year your difficulty is increasing, and you want it removed?—Yes.

*Mr. Thomas Edgley,*

Called; and Examined by Mr. Randle Jackson.

*Mr. Thomas Edgley.*

You are concerned in the coal trade?—I am.

And you know of the alteration proposed by the city of London, for the improvement of London bridge?—I do.

You are a member of a society, called The Society of Owners of Coal Craft, and are the secretary?—I am the secretary of the society of The Owners of Coal Craft.

Are you satisfied that the additional arches now proposed will be sufficient for the purposes of the coal trade?—For the coal trade it will be perfectly sufficient; I speak only for the coal trade.

*Mr. Joseph Sills,*

Called; and Examined by the Committee.

*Mr. Joseph Sills.*

Are you aware of the proposed plan of the improvement of London bridge, by the addition of four new arches?—I am.

Do you consider that sufficient accommodation would be afforded by that alteration to the craft navigating the river?—Certainly not, to the trade in which I am engaged.

What trade is your's?—I am a general wharfinger, keeping craft that are going backwards and forwards, and keeping two large sufferance wharfs in the heart of the city, to which vessels and coasters that lower their masts are continually bringing goods, consequently passing the bridge; and I am quite authorized to say, that my sentiments are those of the petitioners at large, who are now before this honourable Committee.

You are one of the petitioners?—I have the honour to be the chairman.

And one of the grounds of your petition was, great loss of property in the navigation of London bridge; was it not?—Yes.

Do you consider that you should be sufficiently secured against that loss, to which you have been subjected, by the intended alteration?—After having read the report of those eminent persons who have been employed by the corporation of the city of London, there is hardly a particle short of that report with which I should be individually contented; the building a new bridge appears to me to be calculated to promote the trade and prosperity of the city of London in the most eminent degree.

Would you consider yourself sufficiently secured against the risk you have run, by the alteration of the addition of four arches?—If I was satisfied with regard to the risk, I should not be satisfied with the convenience.

Why?—Because with a new bridge, barges could pass at all times of the tide, whereas by the proposed alteration, I am satisfied, as far as my own judgment goes, they could not.

To what report do you refer in your former answer?—The report of Mr. Rennie and Mr. Mountague, recommending the entire removal of the present bridge.

What

Mr. Joseph Sills. (2 May.)

What loss have you ever sustained by going through London bridge, even in its present state?—Very considerable, in the repair of craft, and in the extra price paid to lightermen for navigating vessels through London bridge.

In repair of craft, from accidents sustained at London bridge?—Yes, and from damage of goods, and from extra prices paid lightermen, in consequence of the difficulty of passing the bridge.

Have you got any instances of that description?—Not about me; but the instances stand apparent in our books.

As to repairs?—As to the repairs and losses.

Could you state any particular accident, of a vessel being laid on the starlings, or having broken her back?—Certainly none, as to myself.

Had you any vessel ever sunk there?—Barges, in winter time, have been taken from the wharfs, by the force of the ice, and carried to London bridge, and there remained, piled one upon the other, like pieces of wood torn and destroyed to pieces.

Did you ever see barges lying upon the shore, on piles of ice?—Yes, frequently; and they cannot receive much benefit from such a situation.

Have you ever had a barge sunk, or so damaged, as to create an immense loss to you?—Never, of my own.

Having received so much damage, and your barge-builder's bill being so heavy, have you ever examined your men, to ascertain, whether it has been from their drunkenness, negligence or ignorance, in coming through at an improper time, or bringing two or three barges through at the same time?—I have investigated the matter, in the most particular way, with a view of guarding against those accidents; my lightermen have lived with me, I think, one-and-twenty years, and I have taken the greatest pains to investigate the circumstances, and I never saw either of them in liquor, that I am aware of.

You never found it from negligence, but from the water running so rapidly, and driving them into that situation, and damaging them?—Entirely so.

You state, that though there would not be so much danger, there would be inconvenience, in the proposed alteration; these five arches would be 315 feet space of water; the barges do not work up by the side of the river, and particularly below bridge; would you, in navigating your barge, recommend your men to keep in shore, when you have five large arches to go through?—If I understand your question, it is as to the inconvenience; having stated I have received some damage, you ask me the nature of the inconvenience; the inconvenience at present is this, that I have only a water road to my two large wharfs two hours in each day, so that if a merchant sends goods to me to be shipped at twelve o'clock, and it happens to be high water at ten, I can only thank him for his intention, but they must go to some of the wharfs below bridge, on either side of the water.

Does that arise from the danger of the bridge?—Yes.

Supposing a new bridge was built, would you get a barge through the bridge against the tides?—No, it is not going against the tide; the wharf is at the Three Cranes.

If the fall was reduced from five feet to three inches, would not that do away the great inconvenience that you now complain of?—It would do away a prodigious deal.

Could a vessel, from below bridge, come up to your wharf through those new arches at all times?—I fear not.

Do you entertain any doubt, that they would be enabled to come up, were Mr. Rennie's plan of a new bridge of five arches to be executed?—I do not entertain any.

Then you conceive your property, and the conduct of your business, would be greatly improved by a new bridge, in preference to the alteration of the old one?—Most particularly.

State your reason, why it should be so particularly improved?—I think it proper for me to state to the Committee, that such is the danger of London bridge, that I have actually received letters lately from Newcastle, and other principal places in the north, stating, that unless I will guarantee goods through the bridge, they will remove their trade below bridge; that is within the last six months.

What would be the expense of that insurance?—It is not to be effected; for I have made inquiry at Lloyd's coffee-house repeatedly, and I have never been able to meet with an underwriter who would undertake it at any premium.

Then you mean to say, of that species of trade you are at present deprived?

Appendix, No 1.

Mr. Joseph Sills. (2 May.)

prived?—I shall be, unless there is an alteration in London bridge; it is in consequence of a dreadful accident that has happened, not to me, but to one of my neighbours.

But you do not feel confident that the proposed alteration of the bridge would insure you a continuance of this trade?—I do not.

Do you know of your own knowledge, that there would be a very important increase in that kind of craft in the bottle trade, that are now passing up occasionally, provided there was a new bridge?—I verily believe a thousand fold, I might venture to say, it is so small at present.

What trade did you mean, when you said "the general trade of the country?"—I allude to the trade from Leeds, from Wakefield, and the northern ports generally.

They would come right through the bridge?—They would certainly.

Mr. Rennie's arches will not be higher than your present centre arch; you go through the centre arch now?—We get through.

How could you swim through, more agreeably than you do at present?—Not so rapidly, but more safely.

All the coasters that come through the bridge strike their masts?—Certainly.

And so they would upon Mr. Rennie's plan?—A certain degree of them would, but many would only lower their topmasts.

The new bridge would not be higher than the present?—I am not informed of that exactly at present; nothing could be so desirable to me as a drawbridge.

### *Mr. John William Goss,*

Called; and Examined.

Mr. J. W. Goss.

You are a wharfinger?—I am.

Upon the south side?—Upon the south side, and above the Southwark bridge.

And not above a hundred yards from the last gentleman's wharf?—A few hundred yards.

You have seen what is intended by the corporation, as an additional accommodation to the trade, namely, four new arches; do you, knowing as much as you must do of the water, think those four new arches will give sufficient accommodation for your trade?—Quite sufficient, a great deal more than ever I expected; I never expected that any alteration would take place, further than the opening of one arch on each side of the centre arch.

Have you any craft come from the north of England (the Humber craft) to your wharf?—I have had them, and have refused them.

Have you yourself received any damage from the bridge in its present unfortunate state?—I believe about three-and-thirty years ago, my lighterman, or a man who stowed a cask in a skiff fore and aft instead of athwart, did not secure it sufficiently, and going through at the tail of a lug boat, the boat got a cant, and turned the cask out.

And that was owing to the bad stowage of the cask in your skiff?—Entirely; it was the only accident I ever had that I paid for.

How many years is that ago?—Thirty-three years ago; and I have been at the wharf where I now am three-and-forty years, and do not believe I have paid £. 5 of damage for forty years; and I think sent as many craft through as Mr. Sills.

How many craft a day?—Two or three on an ebb tide, and two or three on a flood tide, every day and every night.

You are a member of the corporation of London?—Yes, and am very proud of the honour too.

How long have you been a member of the corporation?—About sixteen or seventeen years.

### *William Mountague, Esq.*

Called; and Examined.

William Mountague, Esq.

Have you a return of the value of the property you suppose it will be necessary to take down for the new bridge, or to repair the old one?—The order upon me was for an account of the number of houses necessary to be taken down to build a new bridge, and that I should see Mr. Rennie, and confer with him thereon.

In the alteration of the present bridge, do you contemplate any as being necessary to be taken down?—No.

How many houses does it require to be taken down?—I think altogether there are about forty-three.

Appendix, N° 1.

*William Mountague, Esq.*

(2 May.)

[*The following Statement was read:*]

" A Statement of the several Houses and Buildings which will be required to be taken down on the south side of London bridge, in the event of a new bridge being built, and the approaches thereto being made of a rise of about one in twenty-five, which is less than the rise of Fish-street-hill, between Thames-street and Eastcheap.

Bridge foot south, west side:

No. 325 Challoner - - - - tea dealer.
324 Flint and Palmer - - haberdashers.
323 Jordain and Shaw - - provision merchant.

Ditto, east side:

No. 3 Drew - - - - grocer.
2 Ball - - - - pastry cook.
1 Closs - - - - auctioneer.

The above belong to the bridge house estates.

High-street, Southwark, west side:

No. 322 Hervey Haines and Co. - hop factors.
321 Davies - - - - tobacconist.
319 Neave - - - - publican.
318 Ovenden and Evans - - shoemakers.
317 Wilmot - - - - chemist and druggist.
316 Parker - - - - tailor.
315 Empty.
314 Thomas - - - - jeweller.
313 Alderson - - - - tailor.
311 Wright - - - - cheesemonger.
310 Wright - - - - eating house.
309 Smith - - - - trunk maker.
308 Bailey - - - - smith.

Ditto, east side:

No. 14 Tipping - - - - cheesemonger.
13 Butler - - - - straw bonnet shop.
12 Hicks - - - - publican.
11 Manning - - - cutler, &c.
10 Dickens - - - - shoemaker.
9 Closs - - - - auctioneer.
8 R. and S. Bousfield - - drapers.
7 Hubert - - - - tea dealer.
6 Kent - - - - apothecary.
5 Lewis and Fain - - haberdashers.

Tooley-street, south side:

No. 253 Goodchild - - - window glass warehouse.
252 Morren and Blay - - wool staplers.
251 Stacey - - - - porkman.
250 Empty
249 Hooper - - - - chemist.
248 Dutton and Smith - - scale makers.

Tooley-street, north side:

8 7 Hopkins - - - lead and patent shot works,
6 Allen Marshall - - - lead warehouse.
5 Davies - - - - tailor.
4 Thackrah and Lockwood - hop warehouse.
3 Clark and Myers - - hop ditto.
2 Goodchild - - - glass cutter.

" Office of Works, Guildhall,
May 1821.

" *William Mountague*,
Clerk of the City's works."

William Mountague, Esq. (4 May.)

Is not that (a rise of one in 25) much greater than the safety and comfort of the public requires?—It certainly will not be worse than it is now; but I think it ought to be a great deal less rise for all the improvement that is to be made.

Does Mr. Rennie consider the whole of those houses you have stated are necessary for the improvement?—Yes; he considers that the nature of the alteration of the arches will be such, as so far to alter the value of this property, as to make it necessary that it should be taken down.

Can you state to the Committee, upon your calculation, what has been the average amount of the cost of that property from the poor's rate?—The property is assessed to the poor's rate at 2,959 *l.* a year, of which 641 *l.* a year stands upon the Bridge House estate; and looking to what has been the expense of the completion of the purchases for the New Post Office, I find that they average, upon the assessments, pretty nearly fifty years purchase; that would be very nearly 150,000 *l.*

Would that include goodwill and all other little charges?—Yes.

What will be deducted from this for the improved rents that will come back again?—I have not made any valuation of what that deduction would be, but I think it would be considerable, probably 50,000 *l.*

Give me your candid opinion as to the rise, as to its convenience to the public?—I think, that, in making such an improvement as that, there ought not to be a greater acclivity to the bridge than we find in Fleet-street, and that is one in forty.

Supposing the rise to be one in forty, where would be the points of departure, north and south?—I cannot tell without calculation from the sections.

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### *Veneris, 4° die Maii,* 1821.

## MR. ALDERMAN WOOD,

### IN THE CHAIR.

### *Mr. Anthony Lyon,*

Called; and Examined.

*Mr. Anthony Lyon.*

ARE you a lighterman?—Yes.

Particularly in the coal trade?—Corn, coal, and all other kinds of trade.

You now occasionally work upon the river yourself?—Yes, certainly.

Not in the west country barges?—No.

Yours are common lighters and barges?—Yes, the barges of the largest description.

You have given evidence before, as to the necessity of making some alteration in the bridge; but have you seen or heard of the intended alterations by the corporation of London, to improve London bridge, by making four additional arches, two of each side of the centre arch?—I heard there was to be an alteration, but I understood there were to be only two large arches.

Upon the plan now produced, being the plan recommended by the corporation of London, for four arches in addition to the present great arch, what is your opinion of the convenience and the advantages that it will offer to the trade of lightermen and otherwise?—There is no doubt of the convenience of it, and I think it will be quite ample waterway with this addition.

You think it quite sufficient?—Yes, I do; we were canvassing this business at Watermen's Hall yesterday, and there was but one opinion; they thought if there were two arches it would be quite sufficient accommodation.

Then the additional two will still make it more convenient?—Most certainly.

If all the present impediments were taken away, which would diminish the fall of water most considerably, will any danger exist in taking vessels through at all times of the tide?—No, I should apprehend not.

Are you of opinion that this, or any other proposed alteration, would be equally good with a new bridge, constructed upon a proper plan?—I can have no objection to a new bridge, most assuredly not; but I think there is no occasion for it, that is my opinion.

Are you aware, that a great quantity of the starlings are to remain in the river in the case of an alteration, which would not be the case with a new bridge?—No.

What would be the effect of that, compared with a new bridge with no starlings attached

*Mr. Anthony Lyon.* (4 May.)

attached to it?—There would be more waterway, and consequently a greater accommodation.

Then, evidence having been given, that in case the alteration takes place, that the starlings must remain as they are at present, are you of opinion that those starlings would still impede the navigation?—No, I do not think they would impede it materially.

Would it at all?—No, I do not think it would at all, because we navigate with one arch, with all these impediments.

In your opinion, as a practical man, do you think that a bridge so altered, and the starlings remaining, would be equally convenient to the navigation as a new bridge having no starlings?—Most assuredly not.

If the alteration, as proposed, by merely the additional arches, was to take place, and the small arches to be left with the starlings as they are now, in the winter when there is ice, it would still accumulate about that part?—The ice would form a pier, but it would not obstruct the navigation.

But it would form a great obstruction in that part of the river?—No, I do not think it would, if there were some blank arches the ice would go in there.

If the arches remain in the present state upon the north side of the bridge, after the alteration, with the starlings connected with them, would not the ice accumulate on that quarter as it used to do, and be a detriment to the wharfs on that side of the river?—It would accumulate, but not to the extent it used to do.

Would it be to such an extent as to be an impediment to the navigation of that side of the river?—It would depend upon the severity of the frost.

There might be a frost that would cause that effect?—Yes.

But if there were a new bridge, with these large arches continued all the way, and the starlings removed, that impediment would not happen?—It would not.

Have not the accumulations on the shoals of the river, been always greater than in any of the central arches that there were?—Certainly.

You have been a great way below bridge as well as above bridge?—Yes.

Is it not general along the river, that ice accumulates more on the shore than it does in the centre?—Yes.

Not only about the bridge, but in every part of the river?—Yes.

But in the six present arches, existing upon the north shore of the river, will not the accumulation be greater and more inconvenient at London bridge, than at any other bridge upon the Thames?—Certainly.

Does it not frequently happen in severe frosts, that the corn and coal barges are set fast below bridge as well as above bridge by the ice?—Very seldom below the bridge.

Not in severe frosts?—No; the ships haul ashore on the sides, and make a passage for the ice.

Do you think, if a new bridge were constructed, it would be liable to as frequent accumulations of ice, as those which now attach themselves to the starlings?—No, certainly not.

Does not the bridge prevent the ice from floating in large masses against, and injuring the tiers of vessels below bridge?—It certainly is a benefit to people below bridge, for when we are locked up above bridge, they can work.

In the question it is meant, whether in reality the ice coming from the upper part of the country, does not either get stopped or broken by the bridge, so as to render it less prejudicial to the ships below bridge?—It breaks the ice materially going through the bridge, and every bridge it passes breaks it.

### *Mr. Joseph Sills*, again Called; and Examined.

*Mr. Joseph Sills.*

I was desired to state, on Wednesday last, by the Committee, what inconvenience I anticipated from the alteration of the four arches, as proposed by this plan; I was taken at that time rather by surprize, and I beg the favour to make a few observations upon it. Having looked at this plan, I am decidedly of opinion, that the six arches that are left on the north side, and the arches at the other end, will occasion such an accumulation of ice, as will in a severe frost extend itself over these other arches, and that the wharfingers and persons who have property above London bridge, will experience a greater degree of the inconvenience than they now sustain; for I will beg leave to inform this honourable Committee, that in times of severe frost, the wharfingers above bridge are compelled to cart their goods for the coasters, and for shipping, to the wharfs below bridge, where the vessels lie, and paying wharfage. Vessels below bridge can get away at almost any period, while the

Appendix, N° 1.

*Mr. Joseph Sills.* (4 May.)

the upper part of the river (in consequence of this bridge) is entirely blocked up with ice; the craft are torn from the wharfs, piles and all, and are seen daily floating up and down the river, representing almost a picture of a deluge. The coal merchants themselves, who have some of them said they will be content with this alteration, actually pay one guinea per chaldron for wharfage and cartage of coals from the wharfs below, to the wharfs above bridge, which must be laid upon the consumer. Thus, gentlemen, I humbly presume that the proposed alteration would not benefit the property above bridge, so much as a new bridge.

During the frost, are the wharfs flooded by water occasionally, occasioned by the stoppage of the ice, and the breaking up of it?—I think I have observed floods to precede a considerable frost.

Are your wharfs overflowed very much by the floods, by the ice breaking up?—My wharfs have not been overflowed.

When you speak of the necessity of paying a guinea per chaldron for lighterage and wharfage of coals, is it not from the extent of risk there is in navigating the barges, even below bridge?—No, it is because the coal lightermen above bridge are deprived of the power of sending their craft below bridge at all.

What occasions the excessive charge?—The cartage.

A person below bridge, supplying some of the same customers as those others may do above bridge, is not he of necessity obliged to charge that to his customers?—I am not a coal merchant, but there are coal merchants in the room, who can answer the question; I have paid the additional expense of carting my goods to the wharfs below bridge.

Was that guinea a chaldron merely from the difficulties that arose of the vessels not getting up the river Thames with the coals, or did it arise from the great scarcity and high price of coals in the market?—I really believe that this was an extra charge, in consequence of the distance only; but I am also well aware, that the charges sometimes, from the consequences mentioned, are considerably greater than one guinea per chaldron.

*William Mountague, Esq.*

Again Called; and Examined.

*W. Mountague, Esq.*

You stated on Wednesday the number of houses that would be necessary to be taken upon the rise, which was considered in Mr. Rennie's plan of a new bridge?—Yes.

What was that rise?—One in twenty-five.

What difference would that make from the present rise to London bridge?—The rise of London bridge, on the city side, is now one in forty-one, the steepest part; on the Southwark side, one in nineteen.

What is proposed to be the rise in the new bridge?—The account that I delivered in formerly, was upon Mr. Rennie's proposition, of making it a rise of one in twenty-five.

Are you correct as to the present rise of one in nineteen?—I have it here written down; Fish-street-hill is a rise of one in twenty-one, and from Thames-street it is only one in nineteen.

The return you now hold in your hand, of the number of houses necessary, is it for the bridge in its present site and height?—The statement that I shall now present to the Committee, is an account of the number of houses that will be affected by the construction of the new bridge upon its present site, according to the elevation suggested by Mr. Rennie; the height of the centre arch of the proposed new bridge, must be taken at twenty-nine feet six inches in the clear.

Giving fourteen feet three inches more than the present arch?—Yes.

This is a statement of the number of houses which will be taken down, or affected, by forming the rise to the proposed new bridge, upon a slope of one in forty, instead of one in twenty-five?—At the south end of London bridge the slope of one in forty will extend the line 596 feet from the centre of Tooley-street, southward, to the Borough, by which thirty-five houses on the east side, and forty-one houses on the west side, will be affected, six of which houses are bridge house property; this slope will also make it necessary to extend the line down Tooley-street 650 feet, by which there will be twenty-two houses and buildings on the north side, and thirty on the south side, affected. At the north end of London bridge the same slope, one in forty, will extend the line northward from the centre of Thames-street 137 feet, up Fish-street-hill, by which six houses on the east side, and ten houses on the west side, will be affected, three of which houses are bridge house property;

W. Mountague, Esq. (4 May.)

property; this slope will also make it necessary to extend 280 feet from the centre of Fish-street-hill, along Upper Thames-street, to the west side of Miles's-lane, by which eight houses on the south side, and seven houses and buildings on the north side, will be affected; and also necessary to extend, from the centre of Fish-street-hill 325 feet, along Lower Thames-street, nearly to Botolph-lane, by which eight houses and buildings on the south side, and fourteen houses on the north side, will be affected.

Is that your own calculation?—This is the account that I have had taken.

In your opinion, would one in forty be the best system to act upon?—I think the easier the approach could be made to the bridge the better.

Have you been able to make, since you were here, a nearer calculation of the return of property to set off against the 150,000*l.*?—No, I have not been able to do that; the whole of my time has been occupied in preparing this account, which I have now delivered; and I would take the liberty of suggesting to the Committee, that it may not be required; as it is uncertain whether all the property may be necessary to be taken down; unless an improvement of the streets in width is contemplated, because, until put in operation, it cannot be ascertained what houses would be required to be taken down; some houses that are very low on the ground floors, might require to be taken down, because of the elevation of the ground by which their shops would be affected, whereas, others which may happen to be a step or two above, would be so little affected, as not to require any thing to be done; but none of these points can be ascertained, until a plan of the new bridge, and its rise, is settled.

Had Mr. Rennie been consulted by you, as to the exact quantum of houses, in order to effect this rising, which becomes necessary, because he stated only six houses in his evidence?—In consequence of the order of this Committee, I waited upon Mr. Rennie, and with him, prepared that account which I delivered, stating the number of houses, that one in twenty-five would be affected; with respect to any of the others, he knows nothing about it.

Have you made any calculation of the number of houses that it would be necessary to take down upon the proposed alteration of the old bridge?—There can be very little to be taken down for that purpose; there is only one arch that will be materially raised; there will be nothing to be affected by the alteration, except what may be wanted to make a convenient approach while the work is doing.

Must there be a temporary bridge while the arches are altering?—Not entirely; there must be a temporary bridge to turn the road while it is doing.

What would you gain in height by the new arches in the proposed alteration?—The whole height will be twenty-one feet; as one of the arches will be six feet higher than the present great arch.

Would not that throw the property in High-street, Borough, in a similar situation that you would by a new bridge?—No, there will not be any property affected by it.

That alteration will not operate to the prejudice of the houses on the Southwark side?—No.

### *Lunæ*, 14° *die Maii*, 1821.

## MR. ALDERMAN WOOD,

### IN THE CHAIR.

*Mr. William Broomfield*,

Called; and Examined.

Mr. W. Broomfield. (14 May.)

WHAT are you?—I am a ship owner, or lighterman, at Greenwich.

How long have you been in the habit of navigating the river Thames in barges, or otherwise?—For thirty-four years.

Are you an owner of any vessels yourself?—I am, of various descriptions.

Have you been accustomed to navigate above and below London bridge?—Very little above the bridge, except in regard to taking a gun-brig or two through the bridge.

You have not been much in the habit of coming through the bridge downwards?—No.

The

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*Mr. W. Broomfield.* (14 May.)

The Committee would ask your opinion, if a new bridge were built with five arches, instead of the present large one, and the old bridge removed, what effect do you think it would have upon the navigation above the bridge?—It would answer a great deal to its disadvantage above the bridge.

If the alteration took place in the present bridge, by making four large arches, and removing the water works, do you think that that would injure the navigation above the bridge?—I do think it would materially, in my opinion.

State in what manner?—As the bridge now is, it keeps such a head of water up, that it adds greatly to the advantage of the navigation above the bridge.

Do you not think that it also prevents a good body of water from getting above the bridge?—Yes.

It also prevents its ascent?—Yes, particularly at the first of the tide, but not at the latter part; I suppose it is two feet and a half difference.

Do you conceive that the one corrects the other?—Not in proportion by a foot and a half.

Do you consider that the alteration of making a much larger water-way, would make the river navigable upwards for a less number of hours?—Yes.

State upon what you found that idea, as to making the river navigable upwards for a less number of hours?—Because of the stoppage of the tide; if the bridge were away, it would flow higher, and there would not be that stoppage.

Do you think that the removal of the bridge would cause an increased rapidity of water downwards?—I do.

Do you think that that would endanger the moorings of the ships below bridge?—Do you mean when the ebb tide is running or falling downwards.

Downwards?—I think the tide would ebb lower; it would make upwards of a foot difference.

Upon what do you found that supposition?—Because, at about half ebb, the tide does not ebb so fast in proportion, through the stoppage of the bridge.

In the event of a severe frost, when the river is loaded with ice, do you think London bridge, in its present form, a disservice or protection to the vessels lying in the river, at the chains or wharfs?—A very great service.

State in what respect?—Because the ice comes up in such large bodies, and never would go through the bridge, because the draught of the bridge breaks it before it reaches the bridge; that is to say, before these large bodies of ice come to the starlings or piers.

The Committee ask you, whether, comparing the proposed alteration with the new bridge, you have made any calculation as to the quantity of water that would be admitted above the bridge, and that would then flow down?—I think it would be in proportion about one-half.

Do you know how many arches are proposed to be made by the alteration?—I understand from two to three.

You state that that is your calculation?—Yes.

You suppose that eight arches were thown into four, then what alteration would that make?—I suppose that would make an alteration in the proportion of eight to four.

Then your calculation is not from any measurement or observation of your own?—No; only from my own experience in going up and down the river.

Then, I presume you disapprove of the present water works as they are, and all the obstructions that operate against it, that the public have complained of?—I think there should be an alteration.

What alteration do you think would operate so as to keep the ice down, or what would be beneficial by way of alteration?—One arch upon each side of the bridge, equal to the big one.

Is that opinion formed from any soundings, measurement, or observations of a scientific nature?—Not in the least.

The Committee would ask you, supposing that if there were a large arch, and if ships, by lowering their masts, were enabled to pass through, would not that take a considerable number of vessels up the river that do not go there now?—Certainly it would; but only a small class of vessels could go through.

It would take up a very considerable quantity of vessels that cannot pass as London bridge is now constructed?—It would.

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*Mr. Peter Croxford.* (14 May.)

### *Mr. Peter Croxford,*

Called; and Examined.

What is your profession?—I am a conductor of vessels in and out of the Pool.

You are no pilot?—No.

Do you conduct vessels up above London bridge?—No, I do not.

Who brings you here?—Mr. Barber, of Southwark.

What is your profession?—A lighterman.

*Mr. H. McIntosh.*

### *Mr. Hugh McIntosh,*

Called; and Examined.

What is your address and profession?—No. 19, Charlotte-street, Bloomsbury; and I am in the habit of contracting for public works, such as canals, docks, bridges, railways, turnpikes, &c.

Are you an engineer?—No, I am not; I am a contractor for public works.

You say you are in the habit of contracting for building and repairing bridges, roads, and other such things?—Yes.

The Committee understand that you are a contractor for the repairing and altering the bridge at Rochester?—I am.

Acting under an engineer?—Yes.

Under Mr. Rennie?—Yes.

You have contracted to enlarge an arch or two of Rochester bridge?—To make two arches into one.

You contracted by yourself to repair Rochester bridge, and to make two arches into one?—Yes.

The piers of that bridge are somewhat similar to London bridge?—Yes.

And they have starlings attached to them?—Yes.

Upon the same principles as London bridge?—Yes.

How long do you suppose Rochester bridge has been built?—I cannot really tell.

You do not know by common report at all?—No.

As long as London bridge?—I can only tell from the nature of the buildings; the bridges are much alike, and from the nature and form of the starlings they appear as if they were built about the same time.

In what state have you found the piers of this bridge of Rochester?—When I contracted for the work the foundations of the new work were put in before.

By some other contractor?—By some other persons.

Have you taken any part of those piers down yourself?—Yes.

In what state were they found?—They were in a very good state; but I should say, that the outside stones were not in so good a state as in the inner part of the pier.

What did you find the foundation of the Rochester bridge to stand on?—The foundation was put in before I contracted for the work.

The old foundation had been removed?—Part of the old was removed.

How did that part that did remain appear, was it bound together?—Very well, by cement.

You having declared yourself only a contractor, and not as an engineer; you will please tell the Committee under whom you or those that did that work acted?—Under Mr. Rennie.

Have you been into the excavation lately made into one of the piers of London bridge?—Yes, I have.

Have you examined that minutely?—I believe I have, as far as the excavation would permit.

Have you examined as to the foundation?—Yes, I have.

Does it appear that the pier so worked in upon, stands upon piles, or otherways?—It does not appear that it stands upon piles.

Upon what do you suppose it does stand?—It may stand upon piles, but they must be lower than we have yet gone.

In consequence of that they were out of your sight, and you cannot speak as to them, if there be any?—I cannot.

Having been into that pier, the Committee ask you, whether you suppose the pier, as it is now, is competent to carry an arch similar to the great arch of London bridge?—I have not the least doubt that it is, making a proper foundation.

That requires a little explanation; what do you mean by a proper foundation?—I mean

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Mr. H. M^cIntosh. (14 May.)

I mean that I would take down the face of the pier, as much as six or seven feet to the low water mark, and then, if I found the foundation good, as it appears to be at present, I would build upon it. If it were not so good, I would drive two or three rows of piles, laying planks upon the top, and then commence building upon the top of the planking.

When you talk of doing this, is this to be done with or without a coffer dam?—I could do that without a coffer dam.

You could do that completely, and with certainty, without a coffer dam?—Yes.

Have you done any thing of that kind at Rochester?—No, I have not, as far as driving the piles, because they were driven before; but I have taken down the face of the pier, and commenced building upon the top of the foundation that was made before.

In consequence of that, you appear to have left a great part of the old pier standing as it was?—Yes, I have.

Now you have been speaking of Rochester bridge, let us now come up to London bridge; do you think, under the circumstance which you have seen, that you could, with confidence, carry the arch upon the pier you spoke of, or would you undertake to build one under the guarantee that such arch would stand seven years?—Yes, I would, under the direction of such an engineer as Mr. Rennie.

Would you take upon yourself the risk?—Yes, I would take upon myself the risk.

Suppose Mr. Rennie should disagree with you in opinion, as to what you have stated now; suppose he were to differ from you, would you then do it from your knowledge of the work?—I would engage to build such an arch at my own risk.

Would you guarantee it standing for seven years?—Yes, I would.

Having stated that you would do so, the Committee ask you, as a practical man, if you suppose it would stand for ages after that?—Yes.

Have you seen this drawing of the bridge? [*handing one to the witness.*]—Yes, I have.

You have seen that plan for making the four additional arches?—Yes.

Now, provided the other piers should be as good as that one which you have examined, would you hesitate to contract with the public to build those four arches?—I should have no hesitation whatever.

Have you any idea of the expense of it; have you made any calculation of the expense?—I have, as nearly as this plan (being upon a small scale) will allow me.

At what cost do you think your work would be done, for completing those four arches; what would you contract to do them for?—I would do them for something under the sum of 92,000*l.*

Completely, and to guarantee their standing for seven years?—Yes.

And find good security for so doing?—Yes.

The Committee ask you, whether, after the four arches are completed, and the waterworks all cleared away, you would undertake to keep the whole bridge in repair?—No, I could not; because I have not examined it altogether.

You say that no alteration of the bridge could take place, that would contemplate a removal of the starlings?—No, they must be kept up.

At their present dimensions?—My opinion is, that they might be reduced.

How much?—I cannot answer that question here.

If they were reduced, would you still adhere to your contract of the 92,000*l.*—Yes.

Including the alterations of the starlings?—Yes, as far as the four arches.

You cannot with certainty say, that they could be reduced at all?—Part of them might be reduced, that is made narrower, but not entirely taken away; that is my idea.

Are the starlings at Rochester bridge to be kept up?—Yes, they are; we are at work upon them now.

Are any of the starlings to be taken away at Rochester bridge, or any part of them?—Not that I know of; except the starling under the centre of the arch now building.

Could you take down six or seven feet of the facing of the pier, without removing some part of the starlings?—No, not without taking up some of the stone; or perhaps we could do it without taking up any of the piles in the starlings.

And could you do that without a coffre dam?—Yes, if we did not go below low water mark.

Allow the Committee to ask you, how the starlings are to be reduced without a coffre

Mr. H. M'Intosh. (14 May.)

a coffre dam; not meaning the surface of the starlings, but the reducing of them in size?—That is a different thing; I meant for getting in the foundation for the pier.

In your opinion, then, you could remove six or seven feet in width of the pier, without taking away any part of the starlings?—Yes; but if it were necessary, part could be taken away.

Would it not cause the water to press laterally upon the pier of the bridge?—Yes, it would certainly.

Is it your opinion, that the pier is strong enough to bear any lateral pressure?—I think it is, to the extent necessary.

Then if you think so, what possible danger could arise to the bridge from removing the starlings?—The starlings are lower down; we only cut down the pier to low water.

The Committee ask you again, whether that would not cause the water to press laterally upon the bridge?—Yes, it would, but not so as to endanger the bridge.

The Committee ask you, if it be your opinion, that the pier will bear any degree of lateral pressure, what danger could arise in taking away the starlings?—Because, in taking away the starlings, we endanger the very foundations of the bridge.

Your opinion is, that the only use of the starlings, is to prevent the foundations of the bridge being washed away?—Yes, it is; and keeping the materials in their proper place.

But they do not add to the strength of the bridge, but prevent the lateral pressure upon the pier?—Yes, they support the pier against lateral pressure.

There are now seventeen starlings to this bridge; if the alteration take place, four of them will be removed, and then thirteen will remain. Do not you think, that the navigation of the river would be very much improved if all the starlings were taken away?—I am not an engineer, neither have I given that subject consideration.

You say, that upon this particular starling which you have mentioned, you would not build upon the pier; if that starling were taken away you would not venture to do it?—No, I would not.

And you have given your reason that the starling supports the pier, and you could not be certain of a foundation; then, if that be your opinion, the impediment or nuisance must remain?—Yes, the starlings of the bearing piers must, certainly.

As you have said that you would contract for the alteration, have you seen any plan, or any suggestion of the surveyors, for the building of the new bridge?—No; I have not.

You could not give a similar answer as to that, from your not having seen the plan; you could not say for what sum you could build it?—No, I could not; but I would rather build a new bridge than repair the old one.

That is to say, you would be more ready to make the contract?—I would be equally ready.

Would you conceive, that you could execute a better work for the public by building a new bridge, than by repairing the old one?—That is a question I cannot answer.

Have you ever looked at the present London bridge, as to the impediments it produces as to the navigation of the river?—I always considered London bridge as an impediment to the navigation; I do not know that I ever looked at it with that view.

I ask you, whether, in your judgment, those impediments will be better removed by the alteration of the old bridge, and keeping up all the starlings, or by building a new bridge?—By building a new bridge the impediments will be less.

The Committee ask you, whether, in giving your opinion, that a new bridge would be preferable to repairing the old one, in the present instance, you do not speak of that without reference to the comparative expense of one to the other?—That would be the only thing I should have to consult.

And therefore in saying you would prefer building a new bridge to repairing the old one, you do not mean to say, that it would be more advantageous to the public to build a new bridge than to repair the old one, without comparing the relative expense of both?—No, I do not.

I understand you to state, that looking to the navigation of the river, it would be more advantageous to have a new bridge?—Yes, certainly.

What do you mean by the navigation of the river?—I mean vessels passing up and down under the bridge.

*John Rennie, Esq.*

Called; and Examined.

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*John Rennie, Esq.*

(14 May.)

Have you been engaged as an engineer in the repair of Rochester bridge?—I have.

Have you been called in as an engineer, in the first instance, from the commencement of the alterations?—No, I was not; but when I was appointed engineer to Rochester bridge, about nine months ago, I found the foundation prepared for this new arch; I thought it my duty to inquire how that foundation was made, previous to giving in a plan for completing the arch. At that time a Mr. Sims, who was superintendent of the works was alive (he is since dead,) and I inquired of him in what way the work was done; the information he gave me was this; that about five or six feet was cut off the pier, on each side from whence the arch was to spring, and that it was taken down to the bottom, and it was found that the pier stood upon a very strong floor of piles, driven almost as close as they could stand to each other; some of those piles were decayed, and some of them were sound; there were therefore two feet cut off the heads of them, which brought them to a level of the very low water spring tide, and the space where the decayed piles were, were filled up with new piles in the place of those that were decayed. There were a great many additional new piles driven in the front of those for the foundation of the old pier, quite to the front of the starling. Having made a complete floor (if you will allow the expression) of piles, it was then covered with planks, and upon those the foundations of the new arch were laid, quite independent of the old bridge. With respect to the adequacy of the piles to carry the arch, I had occasion, previously to this work being done, to bore the bed of the river all the way across, or just below the bridge, and I found chalk in every place and part of it; in some places the chalk was not above two or three feet under the bed of the river, and in other places of great depth connected. Therefore, from the information I received, together with that which I acquired myself, I had no doubt the foundation was sufficient to carry a new arch.

Was there any coffre dam made use of to examine the foundation of Rochester bridge?—It was done before I had any thing to do with it.

There was no coffre dam used?—No, there was not; but the piles were so numerous there, that it became a solid body almost of timber.

What quantity of water is there under the arch at low water spring tides?—I believe about eight feet.

You found no difficulty in examining this foundation without a coffre dam?—It was built upon piles, the heads of which came up to the level of low water.

Is it absolutely necessary that the starlings should remain at Rochester bridge?—Without the starlings the bridge would fall.

You have stated, that a number of new piles have been driven; the Committee would wish you to state, as nearly as you can, what proportion you suppose the new piles bear to the old ones?—That is a question I cannot answer, as it was not done by me; but as far as I can guess, there were fully as many new piles driven as there were old ones, perhaps more.

Do you mean in replacing those that were decayed, with the addition of what you might consider necessary to add to the solidity of the foundation?—The number of piles that were decayed, as far as my information goes, were not near so great as the additions that were made of new piles.

Perhaps it would not be an improper question to ask you, the total amount of the contract for doing those works, the original, and the second for making a foundation, and for altering the bridge altogether?—That I cannot say, for their funds got short; I believe it was principally done by the wardens themselves, employing there the parties by contract; but the funds were reduced so low, that they were obliged to stop for many years, before they had money to complete the arch they are now about completing.

What is the present contract of Mr. McIntosh for this arch?—About 10,000*l.* or 11,000*l.*

You do not know what the original estimate was for building Rochester bridge?—No, I have not seen it.

What is the size of this arch, compared with those in the London bridge?—It is about 75 or 80 feet.

What is the size of the centre arch of London bridge?—About the same size; I believe it is thereabouts.

Have

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*John Rennie, Esq.* (14 May.)

Have you any reason to suppose that Rochester bridge was built about the same time as London bridge was built?—Not the present bridge.

Was it originally a stone bridge?—No, it was originally a wooden bridge at Rochester.

When was it altered from a wooden bridge to a stone bridge?—About the year 1550.

Are you able to know, whether there were starlings upon Rochester bridge when it was a wooden bridge?—No.

Was it usual, in antient days, to build wooden bridges upon starlings?—Some were so, but not a great many.

Do you believe, yourself, that those starlings were there when it was a wooden bridge, or a stone one?—That I cannot answer.

Have you seen any account of what would have been the actual expense attendant upon Rochester bridge for the last thirty years?—I have not seen the account, but I know the expenses have been enormous. It requires, as nearly as I can learn, a new starling every year; that is to say, if you were finishing all your starlings, you would begin at one end, and bring them on all in regular succession.

That is one in every nine years?—Yes.

Do you think, that if a new bridge had been built at Rochester, it would have been cheaper to the trustees, than the expenses attendant upon the alteration?—When the first alteration was proposed that has been done, I was asked, as an engineer, to give my opinion about it; but considering that the alteration would turn out a very expensive thing, without producing adequate advantages, I declined being employed, and the fact has turned out as I prophesied.

Then, the first person who undertook the alteration of the bridge did not finish it?—No.

I ask you whether the material expense, and the unsatisfactory result of that repair, did not, in a great degree, originate from the contract not being put into proper hands?—I cannot answer that question, as I did not know into whose hands it was put, and as I knew nothing at all concerning the business when it was going on.

The Committee wish to put this question hypothetically; whether you think that a bridge, upon the principle of the present London bridge, constructed two thousand yards below the present one, would affect the deep water between that presumed site, and the present site of London bridge?—It would diminish it.

Have you examined the excavation which was lately made at one of the piers of London bridge?—I have.

Be good enough to state, without the Committee putting questions to you, your opinion as to that?—It appears that the manner in which the bridge has been founded, has been by throwing in loose rubble stone, with gravel, chalk, and other materials, within a kind of inclosure, made by piles and planks, up as high as the level of low water. Into this rubble matter there seems to have been some small piles driven, and then masonry carried on until it got to a considerable height, several feet above low water; there then seems to be piles round the outer edge of it, with planks upon that on which the ashler work, inclosing the pier, has been laid; and to prevent this rubble from running out from under the pier, the starlings have been formed; so that if the starlings were to be taken away, the rubble, in all probability, would run from under the pier, and of course undermine it.

In consequence of this examination, is your opinion altered, in any respect, regarding the alteration of the bridge, or the building a new one?—I formerly imagined that piles had been driven under the whole of the piers, and that these piles went down into the bed of the river; I now see there is no such thing, and therefore I do not consider it so capable to bear the alteration as I did, when I believed that piles were under every part of it.

If the number of piers necessary were to be removed for the proposed alteration, would you have any reason to apprehend danger to London bridge, from the site that those piles have stood on?—It is possible they might stand, but I should not feel confident.

If the pier be removed, may not the bed of the river be so exposed to the current, as thereby to endanger the pier on each side of those that are to stand?—I have been lately called in by the proprietors of the London bridge water works, to examine the mode of their putting in the foundation of a new well; and in driving the piles, there are many places where they drive them down 15 or 20 feet quite in a soft mud; if therefore, on removing one of the piers, this kind of soft mud shall occur in the space so left open, no doubt there will be a tendency to the mud to come out from the starling, at each of the piers that are left standing, which may considerably lessen their stability.

In the alteration of the present great arch, has any thing of the kind you now describe occurred; has any mud or any thing come out, so as to weaken that arch?—I certainly have not heard of any thing that has come out.

From your experience of 50 years, the Committee want to know, whether any thing of that kind has issued, so as to weaken the piers of that arch?—I have not had an opportunity of knowing whether there are or not; but admitting that there has not, it is no argument that it should not come out in others, because the river is so irregular, that I know that the same rule cannot be followed in the foundation of the different piers of the bridge; that was strongly experienced both in the Southwark and Waterloo bridges.

If those four arches are supposed to be opened, the current will be diminished; would it not be less likely to happen with the great extension intended by four arches than as at present?—It must be observed, that the bottoms of the present locks, where some of those arches are made, is secured by timber and piles; the current, therefore, has not an opportunity of washing away the stuff under it; but if the arches be widened, and those removed, although the current may be less, it is not at all improbable that the stuff may be scoured away.

Does not the quantum of rubble thrown in from time to time, and the large stones, prevent that from occurring?—Yes, and frames of wood thrown across.

You have heard the evidence given by Mr. M^c^Intosh, respecting the mode he proposes of making the alteration of London bridge, by cutting off six or seven feet of the facing, and building stone work from the bottom, and from the piles; do you consider that to be practicable?—It is not easy to say, whether it be practicable or not, as it depends in some measure upon the kind of stone thrown in; I would not risk the little reputation I have upon its success.

Does not the now ascertained fact of Rochester bridge being built upon piles, and London bridge not being built upon piles, make a great difference, as to the strength of the work described by Mr. M^c^Intosh?—Unquestionably it does; and moreover, in Rochester bridge there is only one arch against two thick piers, but if the other arches were to be taken down, and two arches thrown into one pier, it would alter the case very materially. There is one new arch to be done at Rochester bridge, and the two piers from whence that arch springs are of immense thickness, and in fact become abutments in place of piers; but if two arches were to be thrown into one pier, and that pier were to be cut down on both sides, the case would be materially altered.

Do you conceive, from your examination of the pier at London bridge, that it is capable of bearing any degree of lateral pressure upon it?—Its capability of bearing lateral pressure arises principally from the rubble stone being connected on each side by the starlings.

If I understand you rightly, the pier of itself would bear no lateral pressure?—I do not say none.

Looking at the circumstance of London bridge (which the Committee believe is not doubted) being an older bridge than Rochester bridge, and considering that there is no late settlement in any one of the arches, would not that lead you to believe, that there is a great uniformity in the foundation of the different piers?—The rubble stone being supported by the starlings on each side, and according as any of it is carried away, others being thrown in, without the weight being altered at all, I am not aware that it leads to any conclusion of that sort; but when the weight of at least twice, or perhaps thrice the proportion, is thrown upon those piers, it makes a very material alteration as to their stability.

Do you not consider that those piers might safely be supported, if sufficient attention be paid to the reparation of the starlings?—I certainly (as I said before) should not like to risk my credit upon the stability of the bridge with the alterations proposed.

Would you consider that it would be a reason why the corporation of the city of London should not carry into effect the proposed alteration, provided they could meet with a contractor, of sufficient responsibility and credit, to undertake the work at a given price?—As I have always formed my own opinions from my own information and observation, I certainly would not say otherwise than I have said; I have known so many instances of people contracting for works of that kind, and failing in them, that I have not much confidence in those kinds of contracts.

Would you not be satisfied if the parties were substantial, and gave good security?—No I would not, if it went against my own opinion.

Should the alteration proposed be carried into execution, and from any cause the work should fail, would it not occasion a considerable addition to the expense of building a new bridge, independently of the money thrown away in attempting to execute the alteration proposed?—I had the misfortune to find, that in the building of a bridge over the Tweed at Kelso, in the month of May, when two arches came down, and the consequence was, that there was such a hole dug in the bed of the river, that the expense of the new foundation became very great, and the work very troublesome.

Do you mean to say, that a pier of 25 feet will not be sufficient to carry the intended arch?—Certainly it will be so, if the foundation be good.

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## Appendix, No. 2.

## REPORT of George Dance, William Chapman, Daniel Alexander, and James Montague, respecting the Enlargement and Improvement of the Waterway under London Bridge; dated November, 1814.

To the Worshipful Select Committee of Bridge House Lands.

Gentlemen,

WE have the honour to submit to your consideration the following observations, made in pursuance of your resolution of the 15th of October, 1813—"That the construction and state of the piers of London bridge should be examined by your clerk of the works, with such assistance as he might think necessary, who should report their opinion, whether the pier between the fifth lock and sixth lock, or Roger lock; and the pier between the thirteenth little lock, or Queen's lock; and the fourteenth, or King's lock of the bridge, or any other *pier or piers of London bridge* can be taken away, and the arches adjoining thereto respectively laid into one, *with safety to the bridge*, so as to *enlarge and improve the waterway and passage of vessels, through and under the same.*"

The points under discussion, being not only of importance to the city of London, but also to that of its commerce, which materially affects other parts of the kingdom, we have acquired all the requisite knowledge in our power, both by personal examination, and by reference to such records and opinions as we could obtain, and more particularly to the valuable mass of information, published in the year 1799, by the Select Committee of the House of Commons, on the improvement of the port of London; from which, and from the voluminous evidence given before the respective committees of the Lords and Commons, in 1811, on the discussion relative to Southwark bridge, we shall make such extracts or references as may appear relevant. We have also perused various documents and reports, laid at different periods before the bridge committee, to which we must necessarily recur; and as the insertion in the text of our report of all the essential matters referred to, and of the whole of the tables of waterway, and other measurements, would too much interrupt the tenor of the arguments we may find necessary to advance, in support of the measures we recommend; we shall give a portion of this information, either in an appendix or notes, as circumstances may point out; and finally, as a proper division of the subject will conduce to a more easy explanation of it, we shall advert

In the first place, to the original construction of the bridge, and such alterations as have taken place to the present period, so far as relevant to its stability, including the motives for carrying them into effect, and the arguments for maintaining the bridge as it is.

2dly. The ill consequences attendant on the present state of the bridge, the evidence in favour of an essential increase of waterway, and the effects which would result from it.

3dly. The measures which have at different periods been recommended for the protection of the bridge.

4thly. The alterations we find expedient to recommend, with our reasons, in favour of their adoption.

### FIRST SECTION, *viz.*

On the original Construction of the Bridge, with such Alterations as have taken place to the present period, with the Motives for carrying them into Effect, and the Arguments for maintaining the Bridge as it is.

LONDON Bridge, which, according to the history of it, by Mr. Nicholas Hawksmoor, published in 1736, was begun in 1176, and finished in 1209, viz. in thirty-three years, was, like other bridges in that period, built on piles driven into the bed of the river, to what was then deemed a sufficient depth. The wooden platforms on these piles, to support the stone piers,

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piers, appear, from the evidence we shall subjoin, to have been laid at different[*] heights above low water, probably increasing as the level of the water was raised by the progressive contraction of the river, not only by the construction of the wooden stilts on which they are placed, but by the further contraction occasioned by the necessary enlargement of the starlings, arising from the bed of the river wearing down below what they had deemed an expedient depth[†], for the feet of their piles. Thus the causes and effects reciprocally combined to increase the difficulties of completing the bridge, which had obviously been great, and attended with many partial failures, as will appear from no two arches being alike, as well as from the long period in which the work was effecting, which after all was so unstable, that in seventy-three years after its completion, five of the arches fell.

Although at this period no precise intelligence can be obtained of the individual perfection of the stilts, or platforms, on which the piers of London bridge were founded; yet so much general information on the subject is given in Doctor Hutton's Tracts on mathematical and philosophical subjects, under the head of "Queries, concerning London Bridge, (in the year 1746,) with the Answers by the late George Dance, Esq." that we find it expedient to lay the substance of it before you, as the most satisfactory evidence that can be acquired, viz.

1st. "That in the passage under each arch ranges of piles had been driven, with their heads to a sufficient depth under water, to retain the ground or bed of the channel, and prevent its being torn away by the rapidity of the current.

2d. "That the bridge was not originally so wide as it now is, and that the points of the piers have been much extended, in order to erect houses thereon; and that in some parts of the piers fresh casings of stone have been placed before the original ashlar.

3d. "That the depths *under the* different arches at a common low water, were as in the third column in the table, Appendix, No. 6.

There would then, as now, be a fall through the arches, and to give a comparison between the former depths and the present, we have inserted the fourth column, on the supposition of five feet being penned up in the spring ebbs, upon which the table, No. 2, is formed; and although Mr. Dance's table is given, as the low water depth at common tides, the difference of depth under the arches will not be greatly different, particularly as there is reason to presume that common spring tides are meant. The result of the comparison is, that in eight of the arches the depth was nearly as at present; that under seven of the arches it was formerly from nearly two feet to seven feet deeper than now, but not much exceeding four feet on the average; and under four of the arches (two of which formed the present great one) the water was on an average three feet shallower, so that on the whole the difference is not essential, although greater in 1746, exclusive of the borough shore arch being then open.

4th. "That the level of the under bed, or lower side of the first course of stones of the piers, is various, some being two feet four inches, some one foot eleven inches, some one foot ten inches, some one foot three inches, some one foot one inch above low water mark, and some are six feet, some five feet eight inches, some four feet six inches, some four feet one inch, and some four feet below the surface of the starlings. These levels are as correct as they could be obtained, there being no opportunity to make observations, but when a breach happens to any of the piers.

5th. "That the masonry was in general laid on the pile heads without any thing intervening, but sometimes pieces of plank, mostly of oak, and a little of elm; some of which is six inches and four inches in thickness, which Mr. Dance apprehended was not originally there, but only placed where reparations have been made, on which account they were fixed, in order to wedge up tight to the stone work.

6th. "That the piles under the piers are round, rough and uneven, and driven close, and touch one another, but do not seem to be fastened together by any contrivance, except that some have planks upon them, and some have none. These observations are made when breaches happened, so that one might get one, two or three feet within the surface of the piers, but how they were in the middle of the piers, it was impossible to determine; the piles are not fastened by any kirb or capsill.

7th. "A great part of the south pier of the dam lock, was undermined by some of the starling being carried away, and leaving it defenceless there, which gave an opportunity of examining it, about seven feet within; the piles were rough, unhewn, and driven close together; they were chiefly of elm, of about one foot diameter; some of them were taken up, and they were found to be shod with iron.

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[*] Mr. Mylne, in his evidence before the Commons in 1799, says, the stone work of the centre pier of London bridge, was much deeper than he expected, and that it was supported on four concentric ranges of piles, with others round it, forming the starling. The quantum of the depth he does not say, but by plate, the first in the Appendix to the Report of the Committee of the House of Commons on the improvement of the Port of London, it appears to have been nearly five feet.

Mr. John Foulds, in his evidence before the House of our Lords in May 1811, says, that some of the piles supporting the piers, are cut off at low water mark, and some considerably higher, viz. that the platforms of some piers are as low as low water, and some considerably above it.

Mr. Kitching, the tide-carpenter of the bridge, was directed by us to ascertain this point, where he could do it conveniently without injury to the starlings; and the result of his examination was, that the upstream end of the stonework of the pier, between the nonsuch and great locks, was three feet two inches below mean starling height, and that the same part of the pier, between the long entry and chapel lock, was three feet six inches below the same level.

[†] According to plate the 1st in the Appendix to the Report of the Committee of the House of Commons on the improvement of the port of London, these piles appear to have been twelve feet long, which, added to the level of their heads below the top of the starling in the pier, which stood under the present centre arch, brings the feet of these piles to be only eighteen feet under the top of the starlings.

8th. "In every pier there is a set-off or foundation, which stands about seven inches beyond the naked line of the pier, and that set-off is of stone. As to the further projection of starlings, they were, in Mr. Dance's opinion, formed on the first erection of the bridge, because it was apparently impossible for them to stand long without some such defence, but whether so much extended, or in the same shape as at present, is not easy to be determined.

9th. "All the piles under the foundations of the piers which Mr. Dance had seen, were sound at heart; about one inch on the surface of some was decayed, but these were piles which had been for some time exposed to the violence of the flood, by the breaches in the starlings.

10th. "Mr. Dance had seen the *texture of the piers* in several breaches, and it appeared that their insides were filled with rubble, *laid in good mortar*, surrounded by an external face of ashlar, laid in courses."

The ten preceding heads of information are so complete, that no subsequent investigation could essentially add to the knowledge thus attained, excepting that which arose from the removal of the pier and starling, under the present great arch, in 1759, which was given at large by the late Mr. Mylne, in his evidence before the House of Commons in 1799, on the improvement of the port of London, and has been adverted to in a preceding note.

The width of the bridge in its original construction, or rather the length of the straight face of its piers, was, according to the measurement in our late examination, from twenty feet to twenty-four feet four inches, exclusive of the pier on which a chapel was built, according to the custom of the times.

We also found that the faces of the opposite piers were frequently not quite parallel to each other, and the arches over them not uniform in their span, neither did the extremities of the antient piers form any regular line. This last defect was remedied in or about 1759, when the bridge was widened to its present extent of forty-eight feet straight face of pier. The additions to each end of the pier varying from five and a half to eighteen feet. These additional parts likewise frequently vary from the original piers by being generally less in thickness, wherever the latter were more so than usual. Thus the water-way of the bridge above the starlings, if taken at the width of the external arches, would be more than it really is. These external or additional arches also vary in form from the internal or original ones. They in general, according to the practice of the age in which they were built, consist of stone ribs, occupying a portion of the length of the arch, and of one or more concentric arches occupying the whole length, but of different degrees of perfection; yet all of them have every appearance of being durable, with slight repairs, because of the great superincumbent covering which protects them from feeling any partial stress, or vibration, from any weight passing over them.

The eighth arch from the Surrey shore, viz. that over the nonsuch lock, in which there are two antient fissures extending several feet in depth, may, from the same cause, be included in the preceding description as to safety.

The great contraction of the water-way, by the progressive advancement or enlargement of the starlings to secure the foundation of the bridge, *necessarily produced a greater excavation in the contracted passages,* and brought on the necessity of throwing stones into them, to prevent the foot of the starlings being undermined, and thus formed a fall of water, by creating an *artificial weir.*

*This circumstance,* as the city of London was in want of water for household purposes, induced the corporation to grant* to a company, associated for that purpose, liberty to construct water wheels under several of the arches, similarly to what had been done under the bridge of Notre Dame, over the Seine, to raise water to supply the city. Having done this, the corporation found it, of course, incumbent on them to do nothing which would essentially diminish the power of these water wheels; in consequence of which much money has been annually expended to maintain this fall of water, notwithstanding its injurious effects on the lives and properties of those who had occasion to pass through it. The evil, however, had become so great as to occasion, in and subsequent to the year 1758, the removal of a starling of thirty-four feet width, and its superincumbent pier of twenty-one feet thickness, after forming the present great arch over them, and the two adjoining locks. This gave relief to the navigation, but having diminished the power of the water wheels, the corporation found it expedient not only to grant the water company liberty to occupy more arches with their wheels, but also to be themselves at a great charge to raise a sufficient weir, to give the requisite power to these wheels. Having now detailed the manner of building London bridge, and its subsequent alterations, so far as requisite to explain the measures we shall recommend, we shall proceed to the discussion of such arguments as have been adduced in favour of maintaining the bridge in its present state, viz.

1st. The great expense necessarily attendant on any enlargement of water-way.

2d. The danger that would attend any such alteration.

3d. The necessity of full compensation to the water-work company, or the great expense of supplying them with another motive power of equal efficacy.

4th. The

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* The several leases granted by the corporation of London to the London bridge water works, have generally about two hundred and sixty-eight years unexpired in 1814.

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4th. The injury which the upper navigation of the Thames would sustain by letting off the head of water which is now kept up by the bridge, and also the probability of the various embankments above bridge being overflowed in high spring tides, which then will rise so much higher as the difference of flow between the two sides of the bridge.

On this subject, we deem it expedient to narrate concisely such evidence as has been given before the Committees of the Lords and Commons, during their investigation of the means for the improvement of the port of London, and likewise that given during their consideration of the propriety of admitting the erection of the proposed Southwark bridge, viz.

1st. At a meeting (of the bridge committee,) on Thursday the 25th of September 1746, when Mr. *Labelye* recommended and pointed out the necessity of certain measures to decrease the annual repairs of the starlings of London bridge, and increase its water-way, the objections on the part of the committee to the execution of these measures were, lest the "city of London should want a supply of water, and that they were also doubtful of its affecting the navigation."

2d of June 1799. Mr. *John Foulds*, assistant surveyor to London bridge, said, "that the enlargement of the centre arch lowered the river so much, that craft, on the reflux of the tide, could not navigate it in the accustomed manner. The consequence of which was, that on a petition to the bridge committee, seven of the small locks were stopped, which producing such a head as was unnecessary, they were again opened." He further says, "the widening of the centre arch has rendered the navigation more commodious. That the bottoms of several of the locks have been raised; that the centre arch deepens after heavy land floods, but is not so deep by many feet as when he first knew it." He further gave it as his opinion, "that London bridge, in its present state, operated very much as a dam for the water-works, and that without this dam, the upper navigation would not be half so beneficial. Also, that the embankments would be too low a considerable way up the river, if London bridge were removed. Likewise, that it prevented the ice injuring the shipping, by being a general mediator, without which, the ice would cut their cables, and clear them all away; and, that if London bridge were removed, some other dam must be made to preserve the navigation." He further says, "that the upper navigation is much better than it was forty-seven years before."

3d. Mr. *John Lashbrook*, lighterman, in his evidence before the Committee of the House of Commons, on the Southwark bridge bill, in April 1811, "supposes, that the starlings of London bridge pen up six feet of water, in spring tides, to the back country." Mr. *Lashbrook* further said, "that vessels above bridge sometimes lie dry for want of water on several shoals; one at the lower side of Putney bridge, which extends two-thirds across the water; and that the other places are principally between Hammersmith and Putney."

4th. Mr. *Robert Williams*, lighterman, says, "that if London bridge were removed, water would be very scarce from London bridge to Putney, nearly bare ground."

5th. *Daniel Morton*, a working lighterman, says, "he has seen the river ebb opposite Somerset House, so that he could scarcely get over with his wherry, and that if the bridge were altered, a loaded barge would not come down New Lambeth Reach."

6th. Mr. *Rennie* "thought, that if London bridge were removed, some part of the river banks, from Westminster up to Chelsea, would require to be raised from twelve to eighteen inches, but that it would not be attended with any great expense. He does not think that the higher flow above London bridge, if it were removed, would fill any warehouses or cellars; but if so, he would be glad to raise his own wharf for the sake of the improved navigation."

7th. Mr. *John Hamer*, lighterman, gave in evidence, "that he remembered two arches of London bridge being made into one; and that when the great arch was made, the water was drawn out of the upper part of the river, and the shoals were seen oftener than they ever were before by the ebbing of the tides, and it shortened the water. That they then stopped up two little locks, which eased the navigation a great deal." He further said, "the bargemen had complained of the water being drawn off; but that he could not answer whether the stoppage of the two locks restored the water, because it was out of his distance, not going so high as the western barges; but he has heard them complain of it. He seldom went above Chelsea."

8th. Mr. *Robert Letts*, master lighterman, said, "that London bridge locks up not much less than eight or nine feet when there is a heavy land flood, and that the removal of the dam would, in his opinion, be injurious to navigation."

9th. Mr. *Robert Williams*, a lighterman, said, "that if London bridge were removed, the bed of the river would be quite dry in many places between the present scite of it and Putney; and that he thought it would certainly prevent the west country barges from drawing at a much earlier period, than they are now obliged to stop at."

10th. Mr. *Thomas Swithin*, a surveyor, under the London bridge committee, "thought a total removal of the dam at London bridge, would be very injurious to the upper navigation, as it penned up in strong tides five to six feet, and in neap tides, three to four feet after the water had ebbed below the surface of the starlings. On the other hand, he thought, that if this pen were removed, *a much larger quantity* of water would go up the river, and that it would go considerably higher than it now does; at the same time, that it would occasion less depth of water upwards, than there is at present when the tide is down."

11th. Mr. *James Montague*, (surveyor to the committee for improving the port of London,) gave in evidence, "that above London bridge, the bed of the river generally consists of hard sand and gravel, and below that, of different strata of loam clay and chalk, That a great deal of the bed of the river upwards is shingle (or large gravel,) through which, he thought, the increased velocity of the current, in consequence of the removal of London bridge, would not operate in forming a channel. That he saw at Laleham, a land flood of more considerable velocity than could be produced by the causes which would ensue from the removal of London bridge; and that he thought, it had a very small effect on the shingle."

12th. The late Mr. *John Smeaton,* in his report of March 18, 1763, "recommended the raising the bed of the great lock to the level of eleven feet under the top of the starlings, the same as in the draw lock; and also to raise such others as were unnecessarily deep, and to stop two up entirely, which were of little consequence to navigation, so as to reduce the water-way below the starlings *to what it was before the formation of that arch*; and also, that an additional arch should be occupied by a water wheel, so that by these combined means, *the power of the water works might be restored to what it was*; for which purpose he also recommended the starlings under the great arch to be each of them *widened three feet,* and *long entry* and *chapel locks to be stopped up* to starling height."

The leading objects of Mr. Smeaton, who was an able engineer, has obviously been to maintain the power of the water works, in the state they were previously to the substitution of the great arch, in place of the two small ones and their intervening pier and starling; exclusively of which paramount object, he expressly says, in his report to the bridge committee of April 29, 1790, "that the making of the bridge more permanent and durable, and the removal and prevention of obstructions in the navigation, have always appeared to him the principal objects of improvement." Unfortunately, these objects, and the maintenance of the motive power of the water works, *were incompatible*; consequently the advice of Mr. Smeaton could only be *subordinately directed to these latter ends.* Having now completely given in detail all the arguments, so far as they have come to our knowledge, which have been advanced in favour of maintaining London bridge, without further alterations as to increase of water-way, we shall proceed to the next division of the subject before us, *viz.*

## SECOND SECTION.

1st. The ill consequences attendant on the present state of the bridge.
2d. The evidence in favour of an essential increase of water-way; and,
3d. The effects which would result from it.

EXCLUSIVE of the progressive alterations we have mentioned, a thorough repair was given to the bridge between the years 1754 and 1770*; and, with such further improvements as will be mentioned in the last division of this subject, the bridge may last for ages. But, whilst the bridge *is used as a weir to pen up water,* its annual repairs must be always considerable; the navigation must continue to be attended with the loss of a number of lives (*vide* Appendix, No. II.) annually, and of property to the amount of many thousands; and also, in some extraordinary flood, with the risk or moral certainty of total demolition. Its sole dependence now is on the rubble stone, annually, or even monthly, cast into the locks, which every great flood, or extraordinary tide, displaces in a considerable degree; and, should any flood, either by its unusual duration, have time to undermine the feet of the piles, or by its extraordinary height, and consequent rapidity, on the sudden melting of snow, and breaking up of a frost, should generate such a velocity of current, as the bed of loose stones could not resist, the whole fabric would fall, similarly to what took place at Hexham in the year 1782; when, according to Mr. Smeaton's memorial, all the rubble defences gave way under the velocity of a thousand feet *per* minute, or a little above it, and the whole fabric fell; although the same defences had remained unmoved, or at least uninjured, under a velocity of current through its arches of nine hundred and thirty feet *per* minute.

This bridge, with many others, affords a useful lesson on the ill consequences of too contracted a water-way, which not only frequently occasions an unexpected total destruction, (*vide* Appendix, No. III.) likewise vast inequality of depth of channel, *viz.* a deep excavation immediately below the contraction, and a bank, dangerous to navigation, a little beyond it. On the other hand, an enlargement of the contracted part is uniformly attended with a diminution of the cavity below it, and greater equalization of the bed of the river, which the subjoined evidence† will prove to have taken place near London bridge; and Mr. Smeaton bears testimony to it on the Tyne, where, in his memorial already mentioned, he says, "that the effects of a rapid flood in 1779, which appears to have deepened the water under the arches of Hexham bridge, had made changes for the better, as the river had acquired a more equal depth from side to side, the shallow parts had become deeper, and the deeper parts, by the depositing gravel, had become shallower."

Besides the danger of destruction of the bridge from the continuance of the present contracted water-way, and the loss of lives and property, there is the daily injury arising to commerce, from the great delay occasioned by the passage under it being dangerous or impracticable, except at given periods of the tide; in proof of which we shall, as in the preceding

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* Mr. Mylne in his evidence on the improvement of the port of London.

† Extract from Mr. Smeaton's Report of April 29th, 1790, to the bridge committee:—He observed, "that in the year 1762, there was a depth of 24 feet at low water under the great arch, in place of 16, (shewn in Mr. Dance's section,) at which time the excavations formed above and below the arch by the rapidity of the current were 36 feet, but that they now only were 28 feet; so that it appeared that stone and chalk driven from the starlings had rested there, to the benefit of navigation."

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preceding chapter, lay before you an *abstract* of such evidence as was given to the committees of both Houses of Parliament on the occasions already mentioned, which we shall preface by a short *abstract* of the report of the House of Commons upon that evidence at large, *viz.*

" They find, that notwithstanding a large sum of money has been annually applied to the repairs of London bridge, that the methods employed to secure it have, in several instances, proved wholly ineffectual. That the bed of the river suffers perpetual and increasing injury from shoals, occasioned partly from the obstruction of the natural course of the tide, and partly from the dispersion of the materials employed for the purpose of strengthening the bridge; that, for several hours *in each day, the navigation downwards is impracticable for small boats,* and *hazardous even for large craft,* and all navigation upwards totally prevented."

1st. Evidence of the late Mr. *Mylne.*—" The navigation of the numerous craft from above bridge is suspended during the latter part of the first half ebb, through the fear of getting on the starlings in the time called horseing water; and, during the latter part of the last half ebb, they are interrupted by the shoals, although they could pass through the bridge. In fact, it is so much a mystery and profession to navigate through this bridge, that the craft of the inland navigation cannot venture into this complicated danger, for the purpose, highly useful, of delivering their cargoes alongside of a vessel in the Pool, or taking a cargo in return."

2d. Evidence before the Southwark Bridge Committee of the House of Commons.—Mr. *Robert Letts,* lighterman, said, " that the shoot upwards through London bridge was very dangerous, and the danger occasionally increased by the number of barges (crowding through one arch) on the arrival of a fleet from the Baltic, particularly when stack-loaded with deals, piled up above the gun-wale, which are liable to take the bridge, and occasion accidents."

3d. Mr. *Anthony Lyon,* said, " That stacks of deals were eight feet above the barges side; that large barges could only go through the centre arch of London bridge; that, if small, they might go through three up to thirty-five tons burthen, but not with safety; that the interruption to passing London bridge, on the ebb tide, is for five or six hours; that all loaded vessels are obliged to stop above bridge until the tide flows; that in nine months he had twice met with serious accidents in going downwards. Once with a barge loaded with chalk, upon a bank, where she struck, about fifty yards below the great arch, occasioned by a great quantity of stones thrown overboard, in the centre of the arch, to secure it, which were carried down and formed that bank; the barge got a hole in her bottom by thus striking, and sunk."

4th. Mr. *John Lashbrook,* lighterman, asserts, " that in spring tides, there is no certainty in navigating through the bridge westward, beyond a little more than half an hour after the flood runs upwards; that the craft are hurried on by the shoot far beyond their destination on either shore."

5th. Mr. *Robert Williams,* and other lightermen, assert, " that craft, on shooting the bridge upwards, are sometimes taken to the eddy on the one side, and sometimes on the other, without its being in the power of the watermen to controul them."

6th. Mr. *Matthew Lucas,* lighterman, gave in evidence, "that the navigation through London bridge had been deemed extremely dangerous for many years past, and that this danger appeared to be progressively increasing, inasmuch as the trade, and consequently the number of craft, have increased. He says, the great arch is not passable, in the latter part of the ebb, for boats of a small description, in consequence of its immense fall, the danger of which is increased by the shallowness of water under it. That out of the nine hundred and thirty feet length of bridge, there is only one hundred and forty-three feet width of navigable water for craft or boats of any kind, viz. between the starlings,

| | | |
|---|---|---|
| Under the great arch - - - - - - - - | 46 | Total 143 feet. |
| Under the five arches, south of it - - - - - | 62 | |
| Under the three arches, north of it - - - - | 35 | |

Three arches being nearly entirely stopped up, and seven appropriated to the water works, five on the north, and two on the south side." He and many others, gave evidence, " that the navigation is stopped by ice at London bridge when it is free through Blackfriars and Westminster bridges; and that at the top of spring tides, there is only fifteen feet six inches height under the centre arch of London bridge, and twenty feet in neap tides; also, that an improvement in the construction of London bridge would cause the navigation to become certain and safe at all times of the tide, and very considerably increase the employ of the watermen. He thinks the removal of the obstructions at London bridge altogether, would be injurious to the upper navigation in a very trivial degree, compared to the benefit derived from the navigation being open, and the dangers removed; and that the tide would flow higher up the river, and form a channel downward, which would only be innavigable for about half an hour in the last of the ebb." He further says, " that as the city of London are constructing locks at Teddington, and between there and Boulter's lock, the plea of keeping up a head of water to assist the navigation out of the tide way would be removed: That the depth under the great arch, increasing instantly after passing to twenty-eight feet, a bar is thrown up lower down, on which craft passing late in the ebb, have struck and sunk, which occasions them generally to come to an anchor above bridge, and lose a tide, and that four-fifths of the coals imported into London pass through London bridge, (consequently nearly eight hundred thousand chaldrons,) that the loss at London bridge increases,

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increases, both from the increase of trade passing through it, and from the bridge itself becoming more dangerous and less navigable."

7th. Mr. *Richard Rowed*, a lighterman, says, "that when a barge drifts into, and fastens in one of the straight locks, they are obliged to take out their beams; that some years back, there was from twenty to thirty feet depth under the great arch, but that lighters now frequently strike in passing through it; that many years since, there were two arches, one to the south, and the other to the north of the great arch, through which he had gone from necessity, when the centre arch was blocked up by craft," (inferring from this the progressive encroachment of the starlings, *vide* Appendix, No. 4;) "that in a severe frost, with snow, the small locks are blocked up in a week or ten days, and then the middle arch, which event occasions a difference of fifty shillings per chaldron, or more, between the ships in the Pool, and the barges at the wharfs above the bridge; that by the removal of the obstructions at the bridge, a barge would gain two hours or more in the first of the flood; that this removal would also, by increasing the current, materially improve the navigation upwards, and deepen the river, and assist barges in coming out of the country; that barges from Brentford, through want of this current, the wind being up the river, will frequently not get farther down than Chelsea or Lambeth, and do not usually arrive so far. That lighters in passing down through London bridge, have been damaged by striking on stones higher than the rest; that he thinks the removal of the obstructions at London bridge, would, from the consequent increase of current in the river, remove many of the sand banks now obstructing it."

8th. Mr. *Robert Banyan*, lighterman; "he did not think that the waters penned up by London bridge, were felt further than Wandsworth or Putney at farthest. He said, that in going from Horsleydown, up the river, in a sailing barge with the wind at east, they are frequently obliged to stop at Putney, until there is water at Putney hill (a shoal thus named) by the rise of the tide, which he supposes would arrive sooner if the obstructions were removed. That coal craft leaving the Pool at half flood, may save the tide to Putney or Chelsea; and that their doing so, will frequently save them two or three days in getting up the country."

In this, and the preceding chapter, so far as relates to the advantages or disadvantages which may result to the navigation above bridge, from the removal of the impediments to the flow and reflux of the tide, we have purposely confined ourselves to the evidence of practical men accustomed to the navigation of the river, in which it will appear, that even those who are apparently hostile to their removal, have nothing essential to alledge in favour of their opinions. The first evidence, is the petition of the bargemen to restore the impediments which had penned up the water, in consequence of which seven of the small locks were stopped, *but were afterwards opened.* This petition naturally arose from there being less depth at low water, over these shoals which had been covered by the formerly penned up water of the bridge, which could not be deepened by the increased current, so suddenly, as the almost instantaneous change which took place on the first removal of the starling and pier. We find also, by the evidence of Mr. Foulds, in 1811, before the Committee relative to Southwark bridge, that the navigation was better than it was forty-seven years before, which fully proves that the evil complained of had ceased to exist. The whole of the evidence in favour of the utility of the dam to the upper navigation, goes no further than to prove their opinion, that it gives more water in the latter part of the ebb, and fore part of the flood, than there would be without it, whilst at the same time they almost generally admit, that it would be attended with some advantages; and what the advantages to the upper navigation would be, in consequence of the removal of obstructions at London bridge, is fully and ably detailed by the witnesses we have cited, particularly by Mr. Lucas and Mr. Rowed.

We shall now concisely give you our opinion, which is substantially the same as the evidence given before the Committees of both Houses by Messrs. Mylne, Jessop, Rennie, Whidby and Walker. The opening of the water under London bridge, to the extent we shall propose it to be done, will leave a very trivial fall in the passage of the water either way; therefore, as in spring tides, five feet water is penned up on the ebb tide, and two feet on the flood, it follows, that to the mean extent of the flow of five feet in the first of the flood, which may safely be assumed to be to Chelsea, a body of water must pass each way equal to five feet, multiplied by the mean width of the river, and the distance up to Chelsea, which is four miles and half; therefore admitting the mean width of the river to be nine hundred feet, the additional quantity of water thus passing will be to 106,920,000 cubic feet. The additional flow of two feet[*] over the top of the tide above bridge, will necessarily carry its flux much higher than at present, consequently beyond Teddington; and admitting the mean between this and the present extent of the flow of spring tides, to be a little above Richmond bridge, *viz.* seventeen miles, the additional quantity of water thus passing and repassing through London bridge, assuming the mean width from this point upwards to be six hundred and sixty feet, will be 112,483,000 cubic feet, from which, as the *present* high water section of the passage through London bridge is stated to be eight thousand feet, and the water after it falls below bridge, runs up for twenty

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[*] The present difference of level on high water spring tides, at a little distance eastward and westward of London bridge, viz. two feet, has been assumed as the basis of the subsequent calculation, not from its being correct, but only sufficiently near the truth. When the check which London bridge now opposes to the tide shall be removed, the water, ceasing to reverberate there, will not flow quite so high at that point; but, on the other hand, it will, aided as it is by the progressive contraction of its channel, pursue its passage up the river with so much additional velocity, as to cause the increase of its rise in the upper part of its course to compensate nearly for its deficiency below.

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twenty minutes at an *average* rate of about one hundred and forty-five feet per minute, (or above one and a half English mile an hour;) we may deduct from the above stated quantity, 22,483,000 cubic feet, which will leave 90,000,000 for the additional quantity passing upwards on the top of the tide, which, combined with the additional water passing in the fore part of it, will amount to 196,920,000 cubic feet, all of which will operate in each of these tides upon the whole river below bridge; which, from the necessarily increased velocity of the current,[*] must both deepen the bed of the river, and expedite the navigation of the ships to and from the Pool, and throughout its intermediate extent; whilst the ninety millions of cubic feet of water on the top of the tide, diminishing progressively in its progress upwards, will proportionably deepen *that part of the river*, by removing the sand banks, and even the gravel itself, where not too much consolidated, in which case it will only be requisite to make *a narrow channel in a proper* direction, and the river itself will widen it to a due extent sufficient for navigation.

We have laid before you abundant evidence to shew, that under the present contracted water-way, which has for ages been progressively diminishing, that craft can only pass through the bridge downwards at certain times of tide, which causes them frequently to come to anchor in place of proceeding directly to their destination, and that the large craft from the upper country, in general, dare not venture at all; but when the impediments shall be obviated, it is obvious, that craft may pass *safely* at all times of tide; that they will not be hurried past their destination in their shoot upwards; that in the event of the construction of Southwark bridge, there will be no danger of their being dashed against its piers; and, also, that in place of laboriously rolling or dragging up the river to the extent of the new locks making by the city, they will be aided in their passage both ways by a tide more or less strong, according to their distance from the extent of its flow.

The only remaining point is, how far the river banks will be more subject to be overflowed by the higher flow of the tide above bridge.

We are of opinion, that the additional rise of river, beyond what the greatest rise is in the present state, cannot be much, because in great land floods, the quantity of fresh water coming down will be so great, as to make the current upwards, even in high spring tides, very languid in the flood, so that of course there can be very little difference of level between the two sides of the bridge, *at these periods when the water must be at the highest*; and as the river banks above bridge are made sufficient for these events, not much addition can be requisite; and whatever may be the extent of flow to be guarded against, it will shew itself so progressively under the gradual enlargement of the water way, that nothing can be apprehended but from remissness.

Having now, we hope, proved that no injury can from this cause arise to the embankments above bridge, and that the upper navigation, in place of being injured, would be greatly amended, we shall terminate this division of our subject.

## THIRD SECTION.

### On the Measures which have at different periods been recommended for the Protection of the Bridge, and the Improvement of the Navigation under it.

SIR *Christopher Wren*'s opinion was, that nine piers out of the nineteen then existing, should be taken away alternately, and nine new arches substituted in the place of eighteen. In the proceedings of the city of London relative to London bridge, in 1746, it appears "that Mr. Labelye objected to the great extent of the starlings, which he alledged to be in a great measure unnecessary, and made the bridge no stronger than it would be were they extended no longer above and below the piers than they were at the sides."

He observed, "that the wooden piles, on which the foundation of London bridge was laid, having been for some years exposed to the air, and to wet and dry for some hours, alternately, twice in every twenty-four hours; the effect was, that those piles decayed in time, and thus occasioned the necessity of surrounding them with starlings to preserve them from ruin, which starlings have been increased by degrees (*vide* Appendix, No. 4,) to the present monstrous size, without necessity; that these starlings must be constantly decaying and in want of repairs; that as long as these starlings continue of such monstrous size, and as long as they are repaired in the same manner, they certainly will occasion the same great expense, and the same great and dangerous fall under the arches, dangerous to navigation and to the lives of watermen and passengers."

He then proposes "casing the piers with three or four feet thickness of strong Portland stone, according to a model he had prepared, and that the starlings should be taken away. By these means, he shewed that the water-way would be increased one hundred and fifty feet six inches, viz. would be extended to three hundred and ninety feet six inches, in place of two hundred and forty-six feet; and that the solid at low water would be reduced to five hundred and forty feet."

He said, "the additional stone work might be set on the present piles, but if they were not sufficient, more might be driven, and that the piles might be cut off three feet below low water mark." And on being asked, if this method would sufficiently secure the piers and their foundations from decay by weather? he answered, "that it would;" in which Mr. Horsenail, the mason, and others agreed, "especially as the stone work was to go two or three feet below the low water mark."

In Mr. Mylne's evidence before the Committees of Parliament, on the improvement of the

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[*] Above bridge, the current in the latter part of the ebb will be increased by the increase of fall, which will, of course, tend to deepen the river upwards.

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the port of London, he asserts, "that the diminution of the starlings cannot be attempted without the whole tumbling; that it would be dangerous to cut down the starlings to low water mark, because the strongest part of the bondage, by which they are held round the original piers, is in the cross ties, which hold the heads of the piles together, which are wholly between the tops of the starlings and low water mark, at a height of five and a half feet, and new ties cannot be placed lower."

Mr. *Smeaton*, in his report to the bridge committee on April 29th, 1790, observes, "that in the great flood of 1762, the water having driven away part of the starlings, and made a considerable vacuity under part of one of the piers; the danger which then existed, and the effects which had arisen to the navigation and water works* by the increase of the starlings, were such as to cause him not to think it prudent to attempt any general diminution of them at present, although eligible to reduce the points of the larger starlings as opportunities might afford; that the most permanent and durable improvement would be, to surround the piers with stone, instead of the several starlings, but that it would be a work of immense labour and expense; that therefore he would recommend, as the next best in his idea, that the sides of the present starlings should be lined with a close planking of elm or beech, about three inches in thickness, and the internal parts filled up with Kentish rag stone, gravel and sand, and the tops of the starlings covered with similar planking. He also thought that the feet of the plank piling might, *where necessary*, be secured by driving strong iron bars, of a particular construction, a considerable depth into the bed of the river."

The late Mr. *Samuel Wyatt*, in his report of 1796, proposed "the addition of two more large arches, and the taking away of the water works, which would improve the navigation, *more particularly for the places up the river*; and he asserted, that the city might be more regularly supplied with water by another steam engine."

## FOURTH SECTION.

### The Alterations we find expedient to recommend, with our Reasons in favour of their adoption.

THE minute detail of facts which we have laid before you, accompanied with various opinions of men of great experience, will, we trust, have already proved the absolute necessity of great enlargement of water way in London bridge, for the following causes:

The annual preservation of many human lives. The prevention of the annual loss of from twenty to thirty thousand pounds in property.

The improvement of the navigation of the Thames from London bridge downwards, by deepening the bed of the river, and facilitating the passage to and from London by the great increase of the velocity of the tide, which, in the present state of the bridge, only runs upwards through the Pool in neap tides at the rate of one knot†.

The saving of from three to four thousand pounds in annual repairs.

And the improvement of the navigation of the Thames, to the extent of its tide-way above bridge, by deepening the river, by quickening the passage of the barges both ways, by the powerful aid of the tide, and taking away the necessity of their waiting for proper periods to pass through the bridge, either upwards or downwards.

Under these impressions, we cannot feel ourselves justified in the recommendation of less efficacious measures than those we are about to describe, *viz.*

1st. The substitution of four new arches in place of eight of the present ones. In the selection of these, we have been influenced by what appeared to us the most eligible combination of the following circumstances, *viz.* the removal of those piers and starlings which most interrupt the water-way; the more equal diffusion of the current in the navigable channel of the river, and consequently giving greater facility to the passage of lighters and vessels under the bridge, and to the strength and symmetry of the whole, so far as attainable under the present discordant width both of piers and arches.

2d. The lowering the height of the starlings six feet, or as much more as circumstances may admit, and easing with a girdle of stone properly cramped and supported, the pile work sustaining each of the piers, so far as it might be exposed by the lowering of the starlings, and also deepening the channels under the arches, for the purpose of giving free admission with moderate velocity, to the influx of the tide and its efflux, combined with the natural current of the river. In the provision for increased water-way through the bridge, it must be taken into consideration, that nearly two hundred millions of cubic feet, in additional quantity of water, will pass through each way in spring tides.

Having on the preceding principles deemed it eligible that the 4th, 6th, 10th, and 12th piers and starlings from the Surrey shore should be recommended to be removed, our next object of attention was to restore, if easily practicable, the navigation of a certain description of sea vessels to the various wharfs above bridge as heretofore, not indeed by the renewal of a drawbridge which formerly existed over the draw lock, but by affording height of passage for vessels of 100 or 150 tons with striking masts.

Some sea vessels of this description, are in the constant practice of trading from Hartley sluice in Northumberland to a bottle wharf on the Surrey shore, near Blackfriars bridge. Notwithstanding their only being able to pass the bridge at the short periods when the current is gentle, and their being always obliged to lie a tide on going downwards in ballast, because

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* The obtaining a fall for the water works was, as already observed, the paramount object with Mr. Smeaton, and this induced him to extend the starlings under the great arch three feet on each side, and do other things to increase the current.

† According to the evidence of Mr. Ralph Walker, before the Committee of the House of Commons.

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cause they have not height to pass under the centre arch near high water, and are compelled to wait until the returning flood just commences to run upwards through the bridge. Therefore, were one of the proposed new arches to be made six feet higher than the present centre arch, more than nine-tenths of the coasting vessels trading to London, colliers excepted, might with safety, when the current through the bridge is rendered comparatively trivial, navigate to the wharfs above bridge, from whence a large portion of the articles conveyed by these vessels, are landed or shipped, and when once provided with striking masts, their progress would not be impeded to as far as there would be sufficient depth of water. An increased height of passage through the bridge is also requisite for the large craft at present navigating the river, as many of them injure their masts in passing through the centre arch, after three quarters flood, and leave visible marks along the crown of its soffite, as well as on the exterior face of the arch.

The object of greater height of archway cannot of course be obtained without raising the roadway of the bridge, which, on examination, we find can be done with great ease, and without any greater ascent than at present exists in a part of the bridge, none of which is inconvenient to loaded waggons, exclusively of its *approach* from Tooley-street, *which* forms no part of the bridge. The commencing height on the Surry shore, of the top of the cornice which nearly runs parallel to the road, and on the same level, is nine feet nine inches above the height of common spring tides, and on the south side of the ornamented buttress over the sixth pier, from the Surrey shore, it is nearly twenty feet six inches from the same line of high water; therefore, there is a rise of ten feet nine inches, which as the horizontal distance (by the engraved plan from which the preceding heights have been taken) is two hundred and sixty-four feet, amounts very nearly to one and a half inches rise per yard. This degree of ascent, if it were continued to above the crown of the proposed *great* arch over Long Entry and Chapel locks (which would be five hundred and seventeen feet from the Surry shore), would accord with a height of nearly thirty-one feet above the level of the common spring tide high water; for the top of the cornice, which, although desirable, for giving great height under the proposed arch, would require too much ascent from the London shore, and the bridge to be raised too considerably on each side of this central point.

The present centre arch is barely seventeen feet above common spring tides, and we conceive that an additional height of six feet, ought to be obtained under the proposed great arch immediately north of the present centre one, as it can be acquired without incurring the inconveniences last mentioned, five feet intervening depth between the surface of the pavement and the soffite of the crown of the arch will be sufficient, which will accord with twenty-eight feet above the level of common spring tide high water, marked on the engraved plan of the bridge. The height of the same part of the cornice over the London shore abutment, is nearly ten feet six inches above the same level of tide, and the intervening space is one hundred and forty-two yards, which, at a rise of one and a half inch per yard, would accord with a height of twenty-eight feet three inches, therefore will freely admit of the height required. Consonant to this line of roadway on the bridge, and to the proposed position of the new arches, with due attention to make them all so nearly segments of the same circle, as to cause the same ribs of the centres,* or a portion of them, to answer for all the arches, with a slight addition of lining, avoiding also unnecessary immersion of their haunches at high water; the navigable arches under London bridge, would be as in the following Table, which also shews the increased width of water-way that would be acquired from the removal of the piers and starlings consequent of the proposed improvement.

| ARCHES. | Span according to the Engraved Elevation of London Bridge. | | Width between the Starlings of the Arches. | | Height of the Crown of each Arch above Common Spring Tide High Water. | | Breadth of Pier Removed. | | Breadth of Pier and Starling. | | Level of Impost of Arch below Spring Tide Hig Water. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ft. | in. | Ft. | in. | Ft. | in. | Ft. | in. | Ft. | in. | Ft. | in. |
| 1st. Proposed arch over the 4th and 5th Locks | 72 | 7 | 62 | 3 | 12 | – | 22 | 9 | 34 | 9 | 5 | – |
| 2d. Proposed arch over Roger Lock and Draw Lock | 69 | 5 | 58 | – | 16 | – | 20 | 6 | 34 | – | 2 | – |
| 3d. The present Great Arch | 70 | 5 | 46 | – | 17 | – | 21 | – | 34 | – | 5 nearly | |
| 4th. Proposed arch over the Chapel and Long Entry Locks | 76 | 2 | 65 | – | 23 | – | 35 | 9 | 51 | 3 | 1 | – |
| 5th. Proposed arch over St. Mary's and the Queen's Locks | 78 | 6 | 58 | 9 | 19 | – | 20 | 6 | 35 | 9 | 3 | – |

Navigable width, feet 290.
Increase of width above the starlings, feet 99 : 6.
Increase of width below starling height, feet 155 : 9.

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* The expense of these centres will be greatly reduced by the means of supporting them on the intervening pier between each of the small arches, removed for the construction of that above them.

The bare inspection of the preceding table exhibits the vast advantage which will be acquired in facility of navigation under the bridge, as all the four proposed new arches will be much superior in width of water-way between the starlings to the present great arch, and two of them superior to it in height of passage; so that should it in future be deemed expedient to reserve the arch of greatest height for the passage of sea vessels only, the river craft will be effectually relieved from the inconveniences they now labour under, as they will have four additional arches to pass through in place of one; and also, the whole period of the tide, in place of a portion of it, which will still further reduce the number which may pass at the same time.

The Committee of the House of Commons on the improvement of the port of London, say, in their Report of June 1811, "that it is essential to the improvement and accommodation of the port of London, that London bridge should be rebuilt on such a construction, as to admit a free passage at all times of the tide for such a tonnage at least as the depth of river would admit at present, between London bridge and Blackfriars bridge." The importance of such an acquisition, if attainable, is self-evident. The Committee of the House afterwards explain their idea to be the admission of such vessels with their top-masts struck. This would require such a height of arch as to be out of the question at present; and, if effected, would only admit vessels (with their lower masts standing) to the extent of the next bridge; therefore, as in the Appendix, No. 7, of the same Report, it appears, that out of 7,265 * coasters entered inwards and outwards in 1799 (colliers excepted,) only 116 were above 150 tons, and 6,271 were under 100 tons; and as it is proved beyond all doubt, by the practice of the Hartley traders under the present difficult navigation, that such vessels may with safety have striking masts, it follows, that under the proposed improved state of the navigation, many of those trading vessels will avail themselves of the means of going directly to their respective wharfs.

Whilst it was in the contemplation of the Committee of the House to have a bridge constructed to admit of the passage of sea vessels, they also turned their attention to the "means by which such vessels might be best directed in the middle stream, or prevented from driving to the side, and striking the arch they were passing;" and to obtain the best information on this subject, they made it one of those queries which they submitted to various professional gentlemen, and others, of whom only a few gave answers to it.

Professor *Robison* observed, "that ships might be directed through the arch by dropping a very small anchor to the end of a towline of fifty fathoms, which would drag along the bed of the river, and the ship might steer to a point by her rudder."

He supposes the vessel to go through with a strong tide, and his principle is good, to let her go no faster than to remain under the command of the rudder; but it is liable to objection in practice, because the small anchor in the course of its dragging would be liable to get hold with its fluke of some object, which would not readily give way; and then, if there were not length of rope enough it would either break, or bring up the vessel; or where it met with any light ground, it would not take sufficient hold to give the vessel steerage way to keep her in the middle of the arch. A ponderous stone, or heavy mass of cast iron, attached to a rope or chain, might answer the purpose; but it would be inconvenient for vessels to be provided with such means.

Sir *Samuel Bentham*, in his answer to the same query, said, "that a vessel must either drop through with the tide, or haul through against it, by a hawser to a buoy, and that he thinks five minutes fully sufficient for this passage."

When the weather is moderate, and the tide not too rapid, we conceive any vessel of the description wanted, may safely tow through with the tide with two boats a-head; and when otherwise, and not blowing too strong, we coincide with Sir *Samuel*, taking care, however, that the buoys, or their substitutes, shall not be such as to injure any craft running against them, for which purpose nothing more is requisite than to attach to a fixed mooring at a proper distance above and below the great arch, a spar of light wood, with a chain to its butt, and a ring to the other end.

Having shewn in the preceding table, the proposed increase of width of water-way between the starlings, we have next to advert to the requisite increased depth and other augmentations, *without which* the formation of the proposed arches would be greatly deficient of the desired end.

According to Mr. *Mylne*'s evidence, so often quoted, the comparison of the three great bridges over the Thames at common spring tide high water, stood as under; *viz.*

|  | Section in Superficial Feet. | Water-way through the Bridge. | Comparative Water-way in 100th of whole Section. |
|---|---|---|---|
| Waterway at Westminster Bridge, previously to its building | 19,083 | 15,082 | 79 – |
| Previous water-way at Blackfriars Bridge | 19,010 | 14,768 | 77 6 † |
| Whole scite of London Bridge, from bottom of locks to surface of water | 19,586 | 8,005 | 40 8 |

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* Making about ten or twelve voyages on an average, consequently the actual number of vessels will only be one-tenth or one-twelfth of the entries. Their whole number was 1,127.

† According to measurements we had taken by Mr. Kitching, the water-way under Blackfriars bridge, at

From this document it appears, that all the original water-ways were nearly similar; that the loss of water-way by the construction of Westminster and of Blackfriars bridges, is very little different, and that the water-way of London bridge is only about 8-15 of either of the others, although it has more tide water passing through it by the whole capacity of the intermediate space between high and low water, excepting when land-floods over-ride or retard the tide.

We have added the last column, to show the comparative ratios of their respective water-ways to the whole section occupied, by which it appears, that the whole water-way through London bridge, at the top of the tide, is only forty-one per cent of the full section of the water. This is its most favourable statement, for when below starling height it is much less.

Previously to our explaining the remaining methods by which we propose to remedy this evil, we shall advert to each of those mentioned in the preceding division of our report.

1st. That suggested by Sir Christopher Wren, of making nine great arches in the bridge, over the scites of eighteen small arches, and their intermediate piers.

Nothing more need be said on this plan, than that it would be better to build a new bridge.

On Mr. Labelye's proposed reduction of the height of the starlings, by casing the stilts of the piers with stone, down to three feet below low water mark, and shortening their length to the same projection they now have on the sides; we have already observed, that we agree with him in the propriety of lowering the starlings, and of surrounding the denuded wood work with a strong belt of cut stone, well cramped or bound together, but not to the depth he proposed, as we accord with Mr. Mylne, "that it would be dangerous to cut down the starlings even to low water-mark, because the strongest part of the bondage by which they are held round the original piers, is in the cross ties which hold the heads of the piles together;" neither do we concur with Mr. Labelye in the great reduction he proposes of their length, because were their ends as obtuse as he advised, the quantity of water passing through, with any given central velocity, would be greatly reduced, consequently the fall would be increased, and from the quick lateral direction of a large portion of the water on its entrance into the locks, whirlpools would be formed near the upstream shoulders of the starlings, which combined with the increased velocity, would quickly undermine them.

A gentle curvature from the extremity of pointed starlings, so as to terminate in and coincide with the straight faces of the locks, is certainly the best form; but as the expense of maintaining the starlings will be in some degree commensurate with their extent, it will be eligible to continue the practice lately followed, *viz.* when the extremities want repairing, to take that opportunity of reducing them within reasonable bounds.

Mr. *Smeaton* has observed, "that the most permanent and durable improvement would be to surround the piers with stone instead of the *several starlings*, but that it would be a work of immense labour and expense." If it could be safely executed, this method would be the most effective, in giving great section of water-way.

We conceive the method alluded to by Mr. *Smeaton*, is that which he practised at Hexham bridge, and which is described by Mousieur Gautier in his *Traité des Ponts*, as the method used for securing the piers of the bridge of Saint Esprit from being undermined.

These piers, like those of London bridge, are built on stilts, which were surrounded from time to time with girdles of stone cramped together, and as one course sunk, another was added above. It may easily be conceived, that if the undermining of the lowest girdle did not proceed equally all around this girdle, and the subsequent ones must be prevented from descending, and either break from their fastenings, where unsupported, or a partial undermining must take place. From these causes, the girdles placed round some of the piers of Hexham bridge, did not answer the desired end. We agree with Mr. Smeaton, in the propriety of securing the feet of the piles of the starlings, with other piles without them where necessary; therefore, as we propose both to lower the starlings and deepen the passage through the locks, we recommend, in such parts where the present border of sheet piles will not drive deeper, that foot piles should be driven on their outside, with their heads to a proper depth under water.

We perfectly coincide with Mr. Wyatt, so far as his observations went, but deem the enlargement of two arches not sufficient *for the reasons we have already given.* Having now related the outlines of the leading principles we recommend, we shall proceed to a more particular explanation, and also to the means of carrying them into effect, without danger to the bridge, or inconvenience to the passage over it.

The previous step is undoubtedly to remove the impediments of the water-works, and then to prevent the great indraught to one point, which took place on the opening of the centre* arch of London bridge in 1761 or 1762; it will be advisable to go forward with the deepening of the waterway, and lowering as many starlings as can be effected during the execution of any one of the proposed new arches; and more particularly to secure the feet of the starlings on each side of any new arch about to be opened, and to lay close above and

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at the same level as mean starling height at London bridge, is 6,246 feet; whilst the present mean water-way under London bridge is at that height only 2,855.

If nine inches fall be allowed from Blackfriars to London bridge at the time of tide, when the water is starling height, there will have to be added to the water-way of Blackfriars three-fourths of 786 feet, its width of open passage, the whole will then be 6,835 feet; which compared with that through London bridge, will be as 100 to 41-7.

[*] Mr. Smeaton, in his report of March 18th, 1763, to the Committee of London bridge, says, "that upon opening the great arch, the water finding a more free and open passage, was drawn thither, and some thousand tons of matter appear to have been moved by the action of the tide both ways, the most gross and heavy parts subsiding as soon as the strength of the stream was spent."

and below stream of it, a mass of large and small rubble stone, on a level with the waterway, under the middle of the great arch, which will prevent any more water passing than the due proportion of current on the opening of such arch. With these precautions, it is obvious that no danger can ensue, on the removal of the pier and starling under any arch when completed; and as to the danger of any old arch overturning its pier, bordering on those to be taken away, the possibility of it may be prevented by strong shores across to the intermediate pier between the arches to be taken down. Although, from the experience obtained by the formation of the present great arch of London bridge, and the subsequent dangerous excavation under one of its piers, as described in the parliamentary reports, there appears no probability of the piers settling, when charged with such additional superincumbent weight, as will occur when *two* great arches abut each of them from the same pier; it will be expedient, from *that cause*, to make the arches as light as they can be with propriety, but by no means deficient in strength. On account of the superior advantages attendant on the opening of the two northern arches, in preference tot hose on the Surrey side, it will necessarily be proper to commence with the former, the passage over both of which must of course be provided for by a temporary bridge or bridges, which afterwards may be applied to the same purpose on the other side. The great intercourse by London* bridge will admit of as little impediment as possible; and, therefore, to prevent all interference between carriages proceeding in opposite directions, it will be advisable to have on each side the arches to be taken down, a temporary wooden bridge, of at least half the width of the road way, which the extent of the starlings renders easy of execution.

The principal impediment will be in raising the road way; during which, for short periods only, one half the width can be open at a time. Exclusive of the attainment of additional waterway, by the lowering of the starlings, our further object is to reduce the expense of their repairs. The present causes† of the destruction of their wood work, exclusive of the damage from lighters, which will in future be diminished as the works proceed, are their alternate exposure every tide, and their absolute wear from the velocity of the current; the effect of which is first to wear away the sap vessels, and then to carry off the projecting fibrous parts, of the rapid progress of which we saw several instances in our examination of the starlings. When wood is always immersed in water, and exposed only to such currents as usually pass through bridges, experience has proved that it will last for ages; and we also have in this kingdom, a proof that the wooden casing of piers, when only cased in spring tides (and in a situation like London bridge, not subject to the worm), will last for nearly half a century, without any apparent decay, or any need of repair but from accident.

The present bridge at Newcastle was built in the years 1773 and 1774, and, like the old one, had its piers placed on stilts, which were cut off level with very low tides. Upon a wooden grating, or platform, on these stilts, the stone piers were built. The grating and stilts were surrounded by a coffer, or casing of sheet piles, at an average distance of two feet six inches from the faces of the stone pier, and within a strong cap-piece of oak, supported on large piles at certain intervals, excepting at the angles, where they were close. Two or more of these piles, on every face, were afterwards secured to the base of the pier, by very strong iron straps; and, after filling the coffers, the upper surface within the sheet piling was covered with a course of hewn stone, rising a little from the level of the sheet pile heads, and of the cap-piece. In this state, notwithstanding the daily passage through it of upwards of two hundred heavy craft on an average, the works have remained as already stated; the width of the river between the abutments, which is not exceeded for some distance lower down, but for a short space is rather diminished, is five hundred and twenty-four feet. Its largest arch is fifty-eight feet, and the waterway of the whole nine arches, of which it consists, is three hundred and ninety-three feet; which is further contracted about sixty-three feet, by the casing of the piers, so as to leave about three hundred and thirty feet waterway below their level.

On the other hand, whilst the old bridge existed, surrounded by starlings similar to London bridge, their repairs were excessive, as it is within the memory of many, that when some of the master house-carpenters of Newcastle had no other employment for their journeymen and apprentices, they had only to send them to the bridge carpenter, who had always work for them at the starlings, whose projection on each side was seven or eight feet, and much more at the ends.

Influenced by this established fact, we recommend the lowering of the starlings to such extent as they will admit to be done, which we conceive may be to within three‡ or four feet of common spring tide low water, or perhaps lower.

If

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* The width of roadway over London bridge is rather more than that over any of the other bridges, and fully as wide as the entrances to it; and should it at any future period be found advisable to widen the immediate entrances, and form other avenues converging to them, to accommodate the immense and increasing intercourse between the city and the borough, it will then be easy to widen the carriage road at a moderate charge, by removing one or both the footways to without the present parapets, and supporting them on light cast iron arches, with their soffites above the level of those of the navigable stone arches, to prevent their being struck by the masts of vessels passing under them, against which they may easily be secured, as they cannot be hit by any mast passing from under the arch.

† To these may be added their great height, compared with their hold of the ground, which, at different times, has occasioned parts of the starlings to deviate from their upright position and overhang.

‡ To effect this in any manner preceding the opening of the new arches, it will only be necessary to close the upper openings of the locks bounding any starling to be altered, which may easily be done by driving across them an open double row of piles, to starling height, and filling them with fascines or faggots of brushwood picketted down.

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If only to within four feet (as stated in Appendix, No. 8,) they will on an average be lowered six feet three inches* below the present mean starling height, as shown in the longitudinal section of all the locks and piers; and in No. 5, of the Appendix, where are shown the present level of the bottoms of all the locks, and the extent to which we propose they should be deepened, *viz.* to six feet below spring tide low water, but declining with a moderate slope from each side, in all the large arches, so as to give ten feet depth for the greater part of their width.

On account of want of length of the stilts, if no longer than they are drawn in Plate 1, of the Appendix to the parliamentary report, so often quoted, we have not deemed it expedient to make the bottom of the locks deeper, although it would otherwise be desirable.

In table, No. 5, of the Appendix, it will appear that the present and projected waterways are as under, *viz.*

The present waterway, *above the level of common spring tide low water*, contains only four hundred and fifty-four superficial feet, the bottoms of the 3d, 8th, 10th, 11th, 16th, 17th, and 19th locks from the Surrey shore, lying higher than this level (exclusive of the borough lock, which is stopped up to starling height, except a very small tunnel); consequently, as the low water section of the Thames above bridge† averages nearly four thousand four hundred feet, *viz.* almost ten times the preceding area, it is obvious that the river must be penned up, and pour over these impediments as a weir, and necessarily must occasion those dangers and excavations complained of on the ebb tide.

The present waterway, at mean starling height, is two thousand seven hundred and sixty feet; which, although this height is ten feet three inches above the level of spring tide low water, is considerably less than two-thirds of the section of the river above bridge *at low water*; consequently, whenever the tide lowers to this height, the current through the bridge must be impetuous, and the passage dangerous.

Should the improvements we have proposed be adopted, the section in the bridge at ordinary spring tides low water will be three thousand three hundred feet (*vide* Appendix, No. 7,) or three-fourths of what the low water section of the river is above bridge, and which, should it at this state of the tide run there at the rate of one hundred and eighty feet per minute, would, according to Dr. Hutton's table, occasion a fall of less than three‡ inches through the bridge.

The low water section at Cherry-garden stairs, is eight thousand five hundred and sixty-three feet, and opposite St. Saviour's mill stairs, seven thousand three hundred and sixty-six; and after the obstructions are removed, much more will pass through the bridge than now does through the Pool, which no doubt derives the above low water sections principally from the number of ships constantly lying in it.

Common spring tides cover the starlings at least nine§ feet, at which time, according to Table No. 7, in the Appendix, the water-way through London bridge will be thirteeen thousand eight hundred feet, which is not far short of those mentioned in a former page to be through Westminster and Blackfriars bridges.

These latter consisting of fewer openings, will pass the water with less impediment, and their channels also will deepen, consequently any measures short of what we have proposed would be deficient of the desired end.

According to the account, given in the parliamentary reports of 1799, the progressive rise of spring tides by a journal kept at Shadwell, was as under, *viz.*

| | | Total. | | | | Total Time. | |
|---|---|---|---|---|---|---|---|
| | Feet. | Feet. | in. | Hours. | Min. | Hours. | Min. |
| The 1st quarter flood rises - - | 5. | 0. | 0. | 1. | 11. | 0. | 0. |
| 2d quarter - - - - - | 10. | 15. | 0. | 1. | 11. | 2. | 22. |
| 3d quarter - - - - - | 3. | 18. | 0. | 1. | 11. | 3. | 33. |
| last quarter - - - - - | 0½. | 18. | 6. | 1. | 11. | 4. | 44. |

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* Exclusive of the space occupied by the stone girdles, which will lie at different levels accordant with, but a little above the bases of, the stonework of their respective piers.

† Low water section, opposite the Steel-yard, an ordinary spring tide, four thousand four hundred feet. Low water section, opposite S. E. corner of Brook's wharf, above Queenhithe, four thousand three hundred and fifty feet.

‡ The fall will increase nearly as the squares of the velocity of the current. In estimating the eventual quantity of water which would pass up the river in the first quarter flood, we have made no deduction for this fall, because the present head of water, penned up in spring tides, is frequently one foot more than we have assumed it, *viz.* six feet, which great head *is in part* occasioned by the impediments in the locks occupied by the water-works, *viz.* by the gratings and booms in front of them, as well as from the wheels themselves; also in the various estimated velocities, resulting from the proposed alteration of the bridge, we have given the mean velocity of the stream, which will, in all cases, be considerably less than the central surface velocity; for instance, three hundred feet mean velocity will nearly correspond with three hundred and forty feet central surface velocity. Under less rapidity the *disparity* will progressively become greater, and under quicker motions it will diminish.

§ The high water line in Mr. Dance's engraved plan, is about nine feet six inches, or a little more, above mean starling height.

It consequently appears that in the first quarter flood, the tide rises to the height at which it now frequently is above bridge at low water, and consequently (abating the accumulation of land water) the 106,920,000 cubic feet now penned back should pass through in seventy-one minutes, and as the mean water-way during this five feet rise will be four thousand three hundred superficial feet, the mean velocity will be three hundred and fifty feet per minute, very nearly 3½ knots (or 3½ geographic miles an hour,) which is a moderate current, but as the channel deepens upwards this body of water will increase.

The 90,000,000 cubic feet of water estimated, after the deduction there mentioned to be requisite to fill up the two feet head kept back at high water, will be progressively passing upwards during the whole period between five feet rise and high water (*viz.* during the remaining three quarters tide,) in which case, as the mean water-way would be nine thousand four hundred superficial feet, it will add forty-five feet per minute to what would *otherwise* be the velocity of the tide, *which* would be much the same as now through Westminster and Blackfriars bridges, *viz.* it would increase the present current through them nearly half a knot, but at the approach of low water, the current downwards, above bridge, would be much accelerated, until the channel should be worn down as much as the water is now penned up by the bridge. If the enlargement of water-way were to take place instantaneously, the sand and gravel from the upper part of the river, would probably be brought down faster than even the increased current below bridge could move it onwards to the sea, but as the enlargement will be progressive no such event can take place.

Whenever any estimate shall be made of these projected improvements, which will cause London bridge to cease to be a nuisance, and render it a permanent fabric, you will be able to judge, whether it will be more eligible to carry these works into execution, or to construct a new bridge. One expense, that of giving a new motive power to the bridge water-works, will be common to them both; and to enable us to form some idea of what it would be, we were desirous of obtaining a knowledge of the quantity of water raised by the bridge machinery, and to what height, also the annual expense of repairing the water-wheels, and all the locks and starlings, which are under the care of the water-work company, *viz.* the first six locks and starlings from the London shore, and the 18th and 19th, excepting their heads below bridge. We could obtain no information on these different points, therefore we are unacquainted with what the repairs amount to; but judging from the expenses of the bridge committee in repairing the remainder, we conceive they cannot fall much short of what would maintain a steam engine or engines of equal power to the present water-works.

The Parliamentary Committee on the port of London in 1799, were fully sensible of the vast expense of *removing* the obstructions of London bridge, and enabling sea vessels to pass it; and therefore they suggested the propriety of the city being empowered to enclose wharfs above bridge, and dispose of their sites.

We also find from Mr. Hawksmoor, " that masters of hoys and lighters said a tonnage would be willingly paid for a safe passage through bridge, for the convenience and security of their goods and vessels." It is likewise known, that for the support of the bridge of Saint Esprit over the Rhone, a duty was paid on salt passing up the river to Lyons; but waving all other instances of pontage, we shall pass on to a case perfectly similar to this under discussion. Hull bridge, a stone bridge over the river Hull, two miles from Beverley, was found in times of flood too low for the numerous craft passing up and down that river, in consequence of which, an act of Parliament was obtained in the session* of 1801, enabling commissioners to make a passage under the bridge perfectly navigable at all times, and to charge a small toll on all vessels passing under it.

The dangerous consequences of resting upon imperfect investigation, or ill-founded opinion, in any alteration of London bridge, have alone induced us to the minute attention we have given it, so as to leave nothing of any moment unadverted to, which would, according to our judgment, give you any requisite information.

We are, gentlemen, your most obedient humble servants,
*George Dance*, Clerk of the City's Works.
*William Chapman*, Civil Engineer.
*Daniel Alexander*, Surveyor to Rochester Bridge, and the Trinity House.
*James Mountague*, Surveyor to the Committee for improving the Port of London.

*London, November* 1814.

## Appendix to the preceding Report of Dance and others, (No. I.)

### An Account of the State in which we found the Locks, Arches and Starlings of London Bridge, on December 9th and 10th, 1813.

Surrey shore; Arch 1st, from Surrey shore:—The lock stopped up level with the starlings, excepting a small tunnel through it of three feet two inches by two feet one inch. The opening between the abutment and the original part of the first pier is eleven feet narrower than the external arches. The up-stream addition to the original length of face of this pier is seven feet, and the down-stream addition sixteen feet. The whole in a good state.

Second

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* An Act to alter and amend an Act passed in the seventh year of His present Majesty, intituled, An Act for improving the Navigation of the river Hull, &c."

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Second arch, over the borough wheel lock:—The up-stream side of the north pier a little out of repair, but nothing essential as affecting its stability, or in any other part.

Third arch, over the rock lock:—Easternmost rib partly broken away by barges or lighters, but of no importance. The facings of the piers in good order. South starling, lower side, under repair. Width of bridge from face to face, or length of straight face of pier, forty-eight feet.

Fourth arch:—The stone work in sufficient order. A small repair wanting on lower side of one of the starlings.

Fifth arch:—In a fair state of repair. Lower side of the fifth pier has been injured by barges, and needs some repair.

Sixth arch, over Roger lock:—Upper side of north pier wants a small repair. The arch stones much flushed, but nothing material to affect its stability.

| | | Ft. | In. |
|---|---|---|---|
| North pier, | Up-stream addition to original bridge - - - - | 11 | 0 |
| | Original part - - - - - - - - - | 19 | 0 |
| | Down-stream addition - - - - - - - | 17 | 9 |
| | Total - | 47 | 9 |

Seventh arch, over the draw lock:—The arch all uniform and in excellent condition. The top of the starling on the north side is mean starling height, and from it to the lower side of the impost course is thirteen feet.

Eighth arch, over nonsuch lock:—North pier iron clamped, and two old fissures, which run partly up the arch. Introduced into them a ten-feet rod, in some places four, in others six feet. The general appearance of the fractures is, as if they had remained unaltered for very many years.

Ninth, or centre arch:—Generally in good repair.

Tenth arch, over long entry, or narrow passage lock:—North side in a bad state, as to the ribs, and first arch over them, which in one place shews the soffite of a counter arch of *rubble stone* above it.

Eleventh arch, over chapel lock:—The stone-work in a tolerable state, excepting the face of the south pier. The lower starling points have given way in particular parts, and the upper are bad. The frost and floods had undermined the lower points, although the piles were thirty-six feet long, which occasionally happens in the other locks. The force of the current had likewise displaced the chalk fillings of the starlings under the arches.

Twelfth arch, over St. Mary's lock:—Some of the ribs are much damaged, by barges having struck them.

Thirteenth arch, over little lock, or queen's lock:—The sheeting piles on the south side starling were driven about four years since, when the starlings partially gave way. On the north starling they are in places out of repair.

| | Ft. | In. |
|---|---|---|
| West addition to the bridge is - - - - - - | 18 | 0 |
| Original part - - - - - - - - - - | 24 | 4 |
| East addition - - - - - - - - - - | 5 | 6 |
| Total - | 47 | 10 |

Fourteenth arch, over king's lock:—The arch and piers in good repair generally. Parts of the starlings want filling in with chalk. The effect of the shrinking, or rather of the wearing away of the piles of the north starling, under the arch, which were originally driven close, is such, that in several instances they are upwards of six inches asunder.

Fifteenth arch, over the fifth wheel lock:—In good repair. Up-stream north pier head defective. The voussoirs of the lowest concentric arch are sixteen inches in length; the span is about twenty-nine feet.

Sixteenth arch, over fourth wheel lock:—Face pilings of the starlings defective.

Seventeenth arch, over third wheel lock:—The whole in passable repair. The upper and lower courses of arch stones the same as in the eighteenth.

Eighteenth arch over the second wheel lock:—The masonry generally wants some repair. The bed, or length of tail of the ribs of this arch, is 10 inches, and that of the lower arch 10 inches. The span about twenty-eight feet.

| | Ft. | In. |
|---|---|---|
| The west addition to the pier - - - - - - | 15 | 2 |
| The original part - - - - - - - - - | 0 | 0 |
| The east addition - - - - - - - - - | 13 | 0 |
| Total - - - | 28 | 2 |

Nineteenth arch, over first wheel, or London shore lock:—In a good state; the starlings recently and substantially repaired. Mr. *Kitching*, the tide carpenter, informed us, and shewed us some instances, that where different piles, or other wood work, exposed to the strength of the stream, had been originally compressed perfectly close, no opening had subsequently taken place; but where the passage was ever so small, the wood would wear away, so as to leave an opening of a quarter inch width in a year.

*General remarks:*—The face walls of the bridge, the parapets, &c. are in the most perfect condition.

## Appendix to the preceding Report of Dance and others, No. II.

Appendix, N° 2.

### Evidence relative to the Loss of Lives and Property, from the want of Water-way under London Bridge, from Evidence relative to Southwark Bridge.

Mr. *Anthony Lyon*, lighterman, says, "*that lives are frequently lost* in passing through London bridge, to the amount of about twenty annually; that frequently two or three, sometimes half a dozen accidents, happen in a tide; that the damage to craft is immense, and the whole yearly loss of property about 40,000 *l.*"

Mr. *James Stevenson Tuggy*, lightermen, says, "that twenty or thirty barges in a twelvemonth have their bottoms beat out; sometimes two or three at once."

Mr. *John Lashbrook*, lighterman, thinks, "that twenty lives are lost annually, and from twenty to forty barges."

Mr. *Robert Williams*, lighterman, says, "that thirty lives in twelve months are lost in passing through London bridge."

Mr. *Matthias Lucas* had no doubt, "that on the average of the preceding twenty-five years, the annual losses sustained by injury of property and craft, was not less than 20,000 *l.* by the faulty construction of London bridge; he had seen a number of boats upset, and many sunk."

Mr. *Robert Letts*, lighterman, said, "that barges are frequently carried across the piers of London bridge, and sunk; that the occasion of so many accidents is, that there is but one arch to go through, and the trade so large, that sometimes three or four hundred craft go through in a flood tide."

## Appendix to the preceding Report of Dance and others, No. III.

### Evidence of the probable Destruction of London Bridge.

The late Mr. Mylne, in his evidence on the improvement of the port of London, says, "that if, in such a winter as that of 1740, the ice, on its breaking up, should choak the smaller arches, the artificial substratum of the centre arch would give way, and the whole fall, as several old bridges have done."

Mr. Rennie said, "that the starling of the second pier, from the large arch, on the North side, had most of its timber gone, and the rubble quite exposed to the force of the current; that had he seen any other bridge in the same situation, he should have thought it not likely to stand for any considerable time; that he had long thought the bridge to be in a dangerous tottering state, in which opinion were Mr. Mylne, and other gentlemen he had consulted. Notwithstanding which, by the considerable repairs which have been given to it, it still continues to stand; that he thinks the fall of London bridge would form a great dam, which would overflow the country above it." He further said, "the bridge over the Tweed at Kelso, which he had known for thirty years, was supported by stone starlings round its piers; that during one great ice flood, it had four arches out of the six, very much choaked with ice, and the current running between the narrow starlings in the other two arches, dug out the bottom, and swept the whole away."

He conceived that London bridge, like the bridge at Kelso, may give no warning, but tumble down at once; that his opinions were formed on those of Mr. Mylne and Mr. Smeaton, who often had conversed with him freely about it; that as to the stone work of London bridge, he had no doubt of its durability, provided the foundations stand; that a considerable part of it, but not the whole, would last for ages; that he had known several bridges, besides that of Kelso, carried away through want of a sufficient water-way, which London bridge does not possess; that the breaking up of floods is the time most likely for bridges to fall; that a stone bridge built over the Clyde at Glasgow fell suddenly in that kind of way; in, perhaps, less than half-an-hour, the whole bridge was down. Several lives were lost, and Glasgow overflowed to a great extent; that the bridge was a modern bridge of seven large arches; that the event happened in 1796 or 1797, owing to the foundation being undermined.

The late Mr. Whitworth, in his report of April 1790, said, that many of the starlings were in a shattered condition; and the chalk sunk in them very considerably, especially towards the points, where the water is generally deep, and the ground, he supposes, cut away before the points of the piles, leaving space for the chalk, &c. to work out; that he was told, several of the piles in the arches did not reach the ground; that barges break off piles from the starlings in the great arch; that a great quantity of large stones, some of them above three or four tons weight, have been thrown in at various times, but are no where to be found; that the current is so rapid, he thinks nothing will lie, unless secured by cross ranges of piles.

It further appears, from the bridge committee's report in 1795, that Mr. Dance, in his report of December 6th, 1793, notices great mischiefs having formerly happened by the tide undermining, and carrying away the piles of the fronts, as well as the contents of the starlings; and that, during the execution of the expensive frame-work in the great lock, devised by Mr. Smeaton, a great breach had happened in the front of the south starlings, which, with some other repairs, cost 1,500 *l.* to put in order. It also appears, that this frame-work proved totally inefficacious, after an expenditure of 5,121 *l.*; and that the repair of the nonsuch lock alone, in 1791 and 1792, amounted to 3,125 *l.*

From Mr. Smeaton and Mr. Wooler's report on Newcastle bridge, in 1772, it appears that the starlings of the old bridge, which had recently fallen, only occupied one-third of the

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the extent of water-way. At the site of the bridge, the river was fully as wide as for half a mile downwards. On the other hand, the starlings of London bridge, occupy at present 687 feet out of 930 feet, *viz.* upwards of two-thirds.

They further said, that the starlings of Newcastle bridge were also frequently damaged by craft, and required expensive repairs.

Appendix to the preceding Report of Dance and others, No. IV.

Evidence of progressive Contraction of Water-way under London bridge.

| AUTHORITIES. | Periods. | Width of Water-way between Starlings. | | Width of Water-way above Starling Height. | Total Extent between Abutments. | Superficial Area of Waterway below Starlings. | Superficial Area at Spring Tide Heights. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *in.* | *Feet.* | *Feet.* | *Super feet.* | *Super feet.* |
| Hawksmoor on London Bridge - | 1736 | 194 | – | 450 | — | — | — |
| Mr. Labelye - - - - - | 1746 | 246 | – | - - - | 936 | — | — |
| An Historical Account of antient and modern Bridges, published in - | 1751 | 228 | 10 | 521 | 915 | — | — |
| Mr. Mountain, in October 1762 - | 1757<br>1762 | 259<br>293 | –<br>– | 546<br>567 | 941 | -- | — |
| Mr. Smeaton's Report of March 1763.<br>Preceding formation of great arch - - - - - | 1757 | - - | - | - - - | - - - | 2,073 | — |
| When great arch was opened, and by subsequent increase of depth, February - - - | 1763 | - - | - | - - - | - - - | 2,934 | — |
| After two locks were stopped - | - - | - - | - | - - - | - - - | 2,780 | — |
| After reduction of passage in great arch, and raising the bottom of several locks - | - - | - - | - | - - - | - - - | 2,069 | — |
| Mr. Mylne in his evidence - - | 1767 | - - | - | - - - | - - - | 3,553 | 8,005 |
| Mr. Dance's engraved plan - - | 1799 | 241 | 6 | 513 | 936 | - - - | 7,277 at 9 ft. above starling. |
| Mr. Kitching's measurement - - | 1813 | 239 | 4 | - - - | - - - | 2,810 | — |

From this table it appears that Mr. Hawksmoor has made a mistake in his first figure of the width of water-way, because ten years afterwards, we find Mr. Labelye, who states the width to be 246 feet, *complaining of its progressive contraction,* by the increase of the starlings.

In 1751, we find the passage between them decreased to 228 feet 10 inches; and we are informed by Mr. Mountain, that in 1757, before any alterations by the new arch, there was 259 feet water-way between the starlings, so that they had been enlarged, even beyond what they were in Mr. Labelye's report.

Immediately subsequent to the measurement given by Mr. Mountain, the pier under the centre arch of twenty-one feet width, and its starling of thirty-four feet, were taken away, which brings the measurements to the statement of the next line of the preceding table, *viz.* to 293 feet between the piers. We nevertheless find, that in the course of between thirty and forty years, the width of the water-way, according to Mr. Dance's plan, was reduced to 241 feet 6 inches, viz. diminished 51 feet 6 inches; from which, if we deduct six feet under the great arch, contracted by Mr. Smeaton, and the closing up of the borough lock, which, in its narrowest part, could not have exceeded six feet six inches, we shall have thirty-nine feet for the progressive encroachment of the starlings in that period, since which, according to Mr. Kitching's measurements, they appear to have been nearly stationary, but still diminishing.

The discordance in the total width of all the arches, after accounting for the twenty-one feet added in the period subsequent to 1762, must (after considerable allowance for incorrect measurement, evinced by the diversity of total lengths between the abutments) be accounted for by the difference of the places where they were measured, *viz.* whether in the original part of the bridge, or in one or other of the additions. And in the last instance, from the spans of the arches not only being taken in the narrowest parts, but with the reduction of the offset courses below them, to allow for so much of the haunches of several arches, which are immersed at high water, and intercept so much of the passage.

## Appendix to the preceding Report of Dance and others, No. V.

Table of Water-way in all the Locks, below the Level of Spring Tide Low Water, or of 10 feet 3 inches below mean Starling Height, and of their Spaces filled above that Height, and of the proposed Increase of Width.

| NAMES OF LOCKS. | No. from Surrey Shore. | Width. | | Mean Depth under Spring Tide Low Water. | | Water-way below Level of Low Water. | Mean Height of Bottom above Low Water. | | Water-way filled with Stones above the Level of Low Water. | Proposed additional Width between Starlings. | | Proposed additional Arch-way. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Ft.* | *in.* | *Ft.* | *in.* | *Sup. ft.* | *Ft.* | *in.* | *Sup. ft.* | *Ft.* | *in.* | *Ft.* | *in.* |
| urrey shore lock | 1 | — | | — | | — | — | | — | — | | — | |
| orough wheel lock | 2 | 10 | 5 | 2 | 5 | 25 | | | | | | | |
| ock lock | 3 | 18 | 2 | - - - | | - - - | 1 | 8 | 30 | — | | — | |
| | 4 | 12 | 1 | 1 | 8 | 20 | - - - | | - - - | 34 | 9 | 22 | 9 |
| | 5 | 9 | 3 | 3 | 8 | 34 | - - - | | - - - | | | | |
| oger lock | 6 | 7 | 6 | - - - | | - - - | 2 | 6 | 19 | 34 | — | 20 | 6 |
| raw lock | 7 | 15 | 9 | 2 | 1 | 33 | - - - | | - - - | | | | |
| onsuch lock | 8 | 10 | 1 | - - - | | - - - | 3 | 6 | 35 | — | | — | |
| reat lock | 9 | 45 | 9 | 3 | 5 | 156 | — | | — | — | | — | |
| ong entry lock | 10 | 6 | 5 | - - - | | - - - | 3 | 8 | 23 | 51 | 3 | 35 | 9 |
| hapel lock | 11 | 8 | 2 | - - - | | - - - | 2 | 6 | 20 | | | | |
| t. Mary's lock | 12 | 17 | 3 | 6 | 4 | 109 | - - - | | - - - | 35 | 9 | 20 | 6 |
| ueen's lock | 13 | 7 | 5 | 3 | 6 | 26 | - - - | | - - - | | | | |
| ing's lock | 14 | 12 | 4 | 2 | 1 | 26 | — | | — | — | | — | |
| th wheel lock | 15 | 15 | 9 | Level | | — | — | | — | — | | — | |
| th wheel lock | 16 | 13 | 9 | - - - | | - - - | — | 5 | 6 | — | | — | |
| d wheel lock | 17 | 11 | 10 | - - - | | - - - | 1 | 9 | 21 | — | | — | |
| d wheel lock | 18 | 10 | — | 2 | 4 | 23 | — | | — | — | | — | |
| ondon shore lock | 19 | 7 | 5 | — | 3 | 2 | — | | — | — | | — | |
| | | 239 | 4 | - - - | | 454 | - - - | | 154 | 155 | 9 | 99 | 6 |
| ufficiently approximate | - - - | 240 | — | - - - | | 450 | - - - | | 150 | 156 | — | 100 | — |

## DEDUCTIONS.

| | Sup. Feet. | |
|---|---|---|
| The mean starling height is 10 ft. 3 × 240 is equal to | 2,640 | water-way. |
| Space below low water 450 feet.—150 ft. filled above that level | 300 | |
| Total water-way below mean starling height | 2,760 | |
| Width of archway 513 sup. ft. × 9 ft. rise above starling height | 4,617 | |
| Waterway at common spring tide high water | 7,377 | feet. |

Appendix, N° 2.

Note S. Vide Appendix, No. 7. (*viz.* 936 ft. 423=513 ft.

## Appendix to the preceding Report of Dance and others, No. VI.

Table of Depths at Low Water under the different Arches of London Bridge, as given by the late Mr. Dance, in 1746; and as in December 1813, deduced from Appendix, No. 5, on the supposition of there being Four Feet Fall under the Arches at Low Water common Tides.

| No. of Locks in 1746. | NAMES OF LOCKS. | Depth at Low Water in 1746. | | Present Depth, according to Table, No. 5, admitting the Fall to be Five Feet through the Arches. | |
|---|---|---|---|---|---|
| | | *Ft.* | *in.* | *Ft.* | *in.* |
| 1 | Surrey shore lock | 5 | 9 | Closed to starling height. | |
| 2 | Borough wheel lock | 9 | — | 9 | 5 |
| 3 | Rock lock | 3 | — | 3 | 4 |
| 4 | | 7 | — | 6 | 8 |
| 5 | | 10 | 3 | 8 | 8 |
| 6 | Roger lock | 8 | 7 | 2 | 6 |
| 7 | Draw lock | 8 | 10 | 7 | 1 |
| 8 | Nonsuch lock | 9 | 2 | 1 | 6 |
| 9 | Present great lock | 5 | 9 | 8 | 5 |
| 10 | | 5 | 6 | | |
| 11 | Long entry lock | 3 | 5 | 1 | 4 |
| 12 | Chapel lock | 2 | 4 | 2 | 6 |
| 13 | St. Mary's lock | 8 | 9 | 11 | 4 |
| 14 | Queen's lock | 9 | — | 8 | 6 |
| 15 | King's lock | 6 | 9 | 7 | 1 |
| 16 | 5th wheel lock | 6 | 11 | 5 | — |
| 17 | 4th wheel lock | 4 | 6 | 4 | 7 |
| 18 | 3d wheel lock | 7 | 9 | 3 | 3 |
| 19 | 2d wheel lock | 4 | — | 7 | 4 |
| 20 | London shore lock | 6 | 1 | 5 | 3 |

Appendix, No 2.

## Appendix to the preceding Report of Dance and others, No. VII.

Calculations of Acquisition of Water-way, from lowering the Starlings and casing the Bases of the Piers.

| | Widths Feet. |
|---|---|
| The sum of the greatest* width of each pier is, according to Mr. Dance's engraved plan, when taken at the level of the offsets, to allow for the immersion of the haunches of some arches | 423 |
| Deduct the piers proposed to be taken away, is 99 feet 6 inches, say | 100 |
| Future extent occupied by the piers | 323 |
| Future width of passage between the starlings, according to Table, No. 5, will be 240 feet × 156 feet. Width of those removed | 396 |
| Width of the remaining starlings, (exclusive of the piers above them,) to accord with the length of the bridge, will be | 217 |
| Length of the bridge | 936 feet. |
| | Section in superficial feet. |
| Then, if the top of the stone casings of the piers be only two feet six inches below mean starling height, this portion of the increase of water-way, will be 217 × 2 feet 6 inches, viz. | 542 |
| Supposing the wood work of the starlings to be only lowered to within four feet of low water mark, the height of the casing of the piers above it will then be three feet nine inches; therefore, if the stone casing of the fourteen piers extend four feet on each side, their amount will be 112 feet, and that the starlings of the abutments being eight feet, the whole will be 120 feet, which deducted from 217, the projecting width of the starlings, will give 97 feet to be multiplied by 3 feet 9 inches, for the lower portion of increase of water-way, *viz.* | 364 |
| Total increase by lowering the starlings, superficial feet | 906 |

## Appendix to the preceding Report of Dance and others, No. VIII.

Estimate of the proposed Water-way, at Spring Tide Low Water, at the present mean Starling Height, and at Common Spring Tide High Water.

| | | Feet in superficial feet. |
|---|---|---|
| The width of water-way under the five great arches between the starlings is 284 feet. This reduced by the area of the slopes of ten feet base, on each side, will be equivalent to 234 feet, which multiplied by 4 feet, their additional depth, will give their area of water-way below the proposed bottom of the other locks | | 936 |
| Total width between starlings 396 × 6 feet, the depth in the smaller locks at spring tide low water | | 2,376 |
| Section at spring tides low water feet | | 3,312 |
| Total width between starlings 396 × 10 feet 3 inches, the rise to the present mean starling height | 4,059 | |
| Additional water-way by lowering the starlings, vide No. 7. | 906 | |
| | | 4,965 |
| Section at present starling height feet | | 8,277 |
| Future width of all the arches 936—323, (vide No. 7,) *viz.* 613 × 9 feet, the flow above the present mean starling height | | 5,517 |
| Section at common spring tide high water | | 13,794 feet. |

## Appendix, No. 3.

REPORT of the Clerk of the City's Works, Mr. Rennie, Mr. Chapman, and Mr. James Mountague, on the expediency of enlarging the Water-way under London Bridge, in the manner recommended by Mr. Dance and others, in the year 1814.

To the Worshipful Select Committee for Letting the Bridge House Estates.

GENTLEMEN,

Mountague and others Report.

IN obedience to your order of the 10th of August 1820, we subjoin our report, on the reference to us to consider and report, " Whether the mode of enlarging the water-way under London bridge, recommended by Mr. Dance and others, in their report dated November

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* The greatest widths are sometimes not opposite to each other.

Appendix, Nº 3.

November 1814, will be, in our opinion, under all the circumstances of the case, with reference to expense and subsequent stability, more expedient than the erection of a new bridge."

We take leave to preface our observations by stating, that the time necessarily employed in obtaining correct tidal observations, levels and sections, has occupied, with very little interruption (and that chiefly from weather,) the time, from the orders of the committee in August and September last, to the present period; and having deemed it a measure of the first importance, as affecting the great question, whether any, and if any, what effect enlargement of water-way would have on the navigation of the river above and below London bridge, we have hereunto annexed, as an Appendix, an abstract of the results of such observations, premising that therein, and in this our report, in speaking of high water spring tides, we mean the average spring tide high water at the hermitage entrance to the London docks, as settled, pursuant to act of Parliament, by the corporation of the Trinity House, in August 1800, and which level line has been marked, and the tidal observations made, at all the bridges, from London to Westminster, inclusive.

Although the accurate information obtained has been the result of much labour and expense, we trust it will be considered as having been well bestowed, as it enables us now to state, that either by the enlargement of the water-way of the present bridge, or by removing it, the additional rise of an average spring tide will only be eight inches; for by reference to the Appendix, it will be seen that the average level of high water spring tides is six inches under the datum of the Trinity House, below London bridge, and one foot two inches under the datum, above bridge; whereas, until these levels and sections were correctly made, it was the generally received opinion, that the difference of level was two feet, and it is so considered in the report of 1814; none of these observations having been made previous to the formation of that report, as not within the then order of reference, which went to the consideration of the practicability merely of enlarging the water-way of London bridge, by throwing two arches into one in several parts of the bridge.

Before we dismiss this part of the subject, it may be well to notice the fears that have been entertained by many, arising from the statement of the late eminent engineer Mr. Smeaton, that owing to the increase of water-way in 1759, by the formation of the great arch, the tides had risen, at a medium, about four inches higher above bridge than they did before; and it has consequently been inferred, that every new arch must produce a similar effect, and, of course, that the construction of four new arches, as recommended by the report of 1814, referred to us, would occasion an additional flow of sixteen inches, and so in proportion if more were made, which has already been proved to be impossible, because there is now only eight inches difference of average level between the two sides of the bridge.

In all cases where water is penned up by contraction of channel, and that channel is afterwards progressively enlarged, the first enlargement produces the greatest effect, because of the well-known hydrostatic principle, that a double velocity can only be acquired by four times the height of fall; on which principle, it will be easy to shew that Mr. Smeaton's observation was as near the fact as might be.

Having thus, as we trust, satisfactorily shown that the apprehensions entertained by the proprietors of ground and premises above London bridge, from the increased height of tide that would arise by the enlargement of its water-way, and the consequent injury they would sustain, cannot by possibility take place, we shall next proceed to show the advantages that would arise to the navigation, both above and below London bridge, from the enlargement; *viz.* that as the principal obstruction to the flow of the tide would by this means be removed, the tide water would not only flow further up the river than it now does, but commence its current upwards at an earlier period of the flood.

It would therefore act on the bottom, both above and below bridge, more powerfully, from the increased quantity of water that must necessarily flow up and return on the ebb, as well as from its acting on the bottom at that period of the tide when its scouring effect is the greatest. The shoals in the river would therefore be lowered, and the surface at high water a little raised, as has before been stated.

We are not, however, so sanguine as to expect that the good we have predicted would be obtained to its full extent from the increased water-way of London bridge alone; some artificial assistance would be required on those shoals which are too hard for the current alone to remove.

We shall now proceed to the next important part of the reference, namely, "Whether, under all the circumstances of the case, as to expense and subsequent stability, it will be more expedient to adopt the recommendation of the report of 1814, for making four large arches in lieu of eight small ones."

Referring to the design for enlargement, accompanying that report, it appears to us to have as much uniformity of elevation as the nature of the case would admit, and that the bridge so altered could not well be improved, or the regularity increased, without adding three additional arches in lieu of six small ones, *viz.* two on the north and one on the south of the four there represented, a measure we do not recommend as absolutely essential to the convenience of the navigation of vessels and craft through the bridge, for the wharfs lying at a distance above and below it; but it would be beneficial to the wharfs on both sides of the river, adjoining to the bridge itself.

By the plan above referred to, the water-way of the bridge between the starlings would be increased from 231 feet to 388 feet, and above the starlings, between the piers, from 524 to 618 feet; the area of its water-way, at an average spring tide, from 7,360 feet to 12,043 feet; thus giving an increase of water-way of 4,683 feet. But if the present large arch is retained, the height of that arch above the spring tide being only fifteen feet three inches; the highest arch of the four proposed to be added was six feet more, with which rise it would still fall short of the height under the centre arch of Southwark bridge by eight feet three inches, and be six feet eleven inches under that of Blackfriars. It may be proper here to observe, that this proposed large arch, north of the present great arch, being a segment of a circle of comparatively small radius, the height here spoken of reduces more rapidly than it would do in the arch of a new bridge of much greater radius, which consequently would suffer little diminution of height for a proportionately greater distance.

With respect to the practicability of the measure of enlargement, as was proposed in 1814, we entertain no doubt, as far as regards the erection of four large arches; for although it would be desirable to ascertain, where possible, the state of the piles under the piers, which are by the alteration to receive additional burthens, yet, generally speaking, it is fair to presume they are as capable of performing their office as those of the great arch have been found, and that the danger which arose in its formation from the want of proper precautions, and the obstruction in the performance of the work, occasioned by the great velocity of the current, rendered that work one of greater difficulty than would arise from substituting four large arches in place of eight small ones, as the former would be guarded against, and the latter would be progressively removed.

The estimated cost of these improvements, is 92,000*l.* which is founded on the supposition that the piers are now as sufficient to sustain the increased weight, as they were found on the former enlargement; but if on trial, it should appear that the piers are not in a condition to receive the extra load that they would have to sustain, by the additional weight of four large arches, in place of the present small arches, and that by consequence coffre dams would become necessary, the expense would be greatly increased beyond the sum we have estimated; for a like reason we have not taken into our calculation the increase of areas that would be gained by lowering the starlings, and deepening the waterways in the small arches, although by no means impracticable.

It is scarcely necessary to observe, that the annual expense of reparations to the bridge in its present state, calculated at 3,500*l.* per annum, would be greatly reduced on the completion of the enlargement of waterway, from the consequent diminution of the velocity of the water passing through the openings, and from the decrease of the number of piers and starlings.

Before we enter on the question of a new bridge, it becomes necessary to state the particulars which have been ascertained as to the lineal water-way, areas, and height of the respective bridges, between London bridge and Westminster bridge inclusive.

The Southwark bridge consists of three arches; its waterway between the piers is 660 feet; the height of the soffite of the middle arch is 29 feet 6 inches; the two side arches, 24 feet 2 inches; and the area at spring tides, 13,940 feet.

Blackfriars bridge has nine arches; its waterway between the piers is 787 feet 6 inches; its middle arch is 28 feet 2 inches; its land arches, 17 feet; and area of water-way at spring tides, 14,117 feet.

The Waterloo bridge has nine arches; its waterway between the piers is 1,080 feet; its arches are all of the same height, namely, 27 feet 3 inches; and area of waterway at the average spring tides, 17,707 feet.

Westminster bridge has fifteen arches; its waterway between the piers is 865 feet 9 inches; its middle arch is 26 feet 2 inches; the second arch from the land on the south side is 14 feet 5 inches, that on the north side is 14 feet 11 inches, we say the second arch, because the arch on each side next the land is too low to admit of vessels or craft passing through them; the area of waterway is 15,198 feet.

Thus the area of water-way of the respective bridges, taking London bridge as it now is, and as proposed to be altered by the building of four large arches, according to the plan of 1814, will stand as follows, *viz.*

| | Area in Feet at High Water. | Area in Feet at Low Water. |
|---|---|---|
| London bridge, as it now is, at the average spring tide, taken at the level marked by the elder brethren of the Trinity House - - - | 7,360 | 540 |
| Ditto, when the four large arches are substituted, according to the Plan of 1814, "but without lowering the starlings, and deepening the waterways in the small arches" - - - - - - - | 12,043 | 2,822 |
| Southwark bridge - - - - - - - - - | 13,940 | 5,012 |
| Blackfriars bridge - - - - - - - - - | 14,117 | 3,764 |
| Waterloo bridge - - - - - - - - - - | 17,707 | 3,382 |
| Westminster bridge - - - - - - - - - | 15,198 | 3,750 |

The areas at low water are taken on the levels of the tides, as they now are; but as low water of a spring tide below London bridge is lower than above it, while in neap tides it is comparatively otherwise, in consequence of the obstruction occasioned by London bridge itself. If the areas of the four bridges above London bridge are taken at low water, as they will in all probability be after the bridge is altered, according to the plan of 1814, there would be a considerable diminution in those above, supposing the bottom of the river to

remain

Appendix,
N° 3.

remain of the depth it now is; but as the bottom of the river through all these bridges will be deepened, (with the addition of the artificial assistance before alluded to,) the areas will not be diminished, but on the whole increased.

The areas at high water are taken on the level established by the Trinity House, and therefore no alteration will take place in them, except as to the increased depth of bottom after the obstruction of London bridge is fully removed.

Taking the above statements as our ground-work, it appears that the area of water-way of London bridge at high water of spring tides, as it now is, amounts to little more than half the water-way of the Southwark bridge, there being a difference of 6,580 feet, whereas, according to our ideas, it ought to be somewhat greater, we judge about 14,500; and when altered, by making four large arches, as proposed by the plan of 1814, it will still fall short by about 2,457 feet. To make up this difference, it was also then proposed to lower the height of the starlings, and deepen the water-ways of the small arches; this, however, though practicable, would lead to a heavy additional expense, not to mention considerable risk.

The lineal water-way of the Southwark bridge, as has been before stated, is 660 feet; its area at high water spring tides is 13,940 feet. We recommend that a new bridge, if built, should have five arches, and a lineal water-way of not less than 690 feet; and if we assume an area of water-way at low water nearly the same as the Southwark bridge, the area at high water would be 14,500 feet. The height of the middle arch we recommend to be the same as that of the Southwark bridge, which we find can be obtained without materially increasing the expense of the approaches at either end of the bridge, or rendering the communication with the adjoining streets inconvenient.

In estimating the expense of the erection of a new bridge, we have not entirely depended on calculation, but have referred to the expense of the recent erections of Southwark and Waterloo bridges; by which we find, that we are completely borne out in the amount we now state, namely, that the cost of a new bridge of five arches, faced with Aberdeen granite, or granite of an equally hard and durable quality, will be 430,000*l.* exclusive of a temporary bridge, while the new is building, assumed at 20,000*l.*

In case of enlargement of the present bridge, or the building a new one, an arrangement must be previously made with the proprietors of the London bridge water-works; and provision should also be made, in the event of a new bridge, for the expense of improving the approaches thereto, which we have not considered, as not coming within our reference, and which would require, to give an accurate opinion, surveys, and valuations of the property, a work of much time and expense.

In conclusion, we take leave to observe, that in the event of an alteration, by substituting four large arches, as proposed in 1814, in place of eight small ones, the bridge would still be deficient, in comparison with the other bridges before stated, in water-way, by 2,457 feet, and in the height of its largest arch, by 8 feet 3 inches under that of Southwark bridge. The starlings round all the piers would be an inconvenient obstruction to the navigation; their annual, though then reduced expense of repairs, would still add to the general expense; the access to the wharfs, adjoining the bridge above and below, would not be materially improved, nor the navigation, to the extent it otherwise would be, were the full water-way provided, as in the case of a new bridge; which, if adopted, land floods would be passed off with greater facility; coasters, and even colliers, with striking masts, could navigate to all the extent of the city westward, and even much higher; to the evident advantage of the inhabitants on both shores, and the general interest of commerce.

Unless, therefore, sufficient means cannot be found to effect the building of a new bridge, we have no hesitation in recommending its adoption, in preference to the alteration of the present one.

We are, gentlemen, your most obedient humble servants,
(Signed) *W^m Mountague*, clerk of the city's works.
*John Rennie*, } civil engineers.
*W^m Chapman*, }
*James Mountague*, surveyor to the committee for improving the port of London.

London, 12th March 1821.

Appendix, N° 3.

Appendix referred to in the preceding Report.

## LONDON BRIDGE.

Result of the Levels of Tides, observed from 23d September to 25th October 1820, between the entrance of the London Docks and Westminster Bridge; also of the Transverse Sections of the River Thames at London Bridge, Southwark Bridge, Blackfriars Bridge, Waterloo Bridge, and Westminster Bridge; collected from four Drawings of the above Surveys, made by Mr. Francis Giles, under the direction of Mr. James Mountague; pursuant to an order of the Select Committee of Bridge House Lands, of the 8th September 1820.

### London Docks to London Bridge.

| | | feet. | in. | pts. | | min. | | |
|---|---|---|---|---|---|---|---|---|
| The High Water of Spring Tides at the entrance of the London Docks, averaged a Level of | | 0. | 1. | 5. | higher, and Time | 10 | earlier, | than at the lower side of London Bridge. |
| The Low Water of Ditto | Ditto | 0. | 3. | 0. | lower | 9 | earlier, | Ditto. |
| The High Water of Neap Tides | Ditto | one Level | | | | 8 | earlier, | Ditto. |
| The Low Water of Ditto | Ditto | 0. | 2. | 0. | lower | 14 | earlier, | Ditto. |

### London Bridge.

High Water of the highest Spring Tides occurs at three or four o'clock.—High Water of the lowest Neap Tides occurs at eight or nine o'clock.
Spring Tides flow four to five hours, and ebb seven to eight and a half hours.—Neap Tides flow five to five and a half hours, and ebb six and a half to eight hours.

| | | feet. | in. | | feet. | in. | |
|---|---|---|---|---|---|---|---|
| The High Water of Spring Tides produced an average fall through London Bridge of | | 0. | 8. | but the greatest fall at High Water was | 1. | 1.: | October 24th. |
| The Low Water of Ditto | Ditto | 4. | 4. | but the greatest fall at Low Water was | 5. | 7.: | September 27th. |
| The High Water of Neap Tides | Ditto | 0. | 5. | | | | |
| The Low Water of Ditto | Ditto | 2. | 1. | but the least fall at Low Water was - | 1. | 1.: | October 16th. |

The Flood of Spring Tides of October 21st and 23d, produced slack water through the bridge in about 40 minutes after low water below bridge, from which time a head gradually increased (below bridge) to 1 foot 10 inches at half flood, and then regularly decreased to about 8 inches at high water.

The first flow of these Tides, nevertheless, began above bridge about 20 minutes after low water time below bridge, although the water was then about 2 feet 6 inches higher above than below bridge; the time of low water below bridge averaged 10 minutes earlier than above bridge.

The Ebb of these Tides produced slack water at the bridge about 30 minutes after high water, and then gradually sunk to the greatest fall at low water.

The time of high water of October 21st and 23d, was the same below as above bridge; but the average time of high water spring tides is 9 minutes earlier below than above bridge.

The Flood of a Neap Tide, October 30th, produced slack water through the bridge in about 2 hours after low water time below bridge (when there was some land flood in the river,) from which time a head gradually increased (below bridge) to 1 foot 3 inches at two-thirds flood, and then regularly decreased to 4 inches at high water.

The first flow of this Tide, nevertheless, began above bridge about 1 hour after low water time below bridge, although the water was then 1 foot higher above than below bridge; but the average time of low water below bridge is 32 minutes earlier than above bridge.

The ebb of this Tide produced slack water at the bridge about 15 minutes after high water above bridge, and then gradually sunk to its greatest fall at low water.

The time of high water of October 30th, was 15 minutes earlier below than above bridge, and the average time of high water neap tides is 15 minutes earlier below than above bridge.

Appendix, N° 3.

### LONDON BRIDGE to WESTMINSTER BRIDGE.

The High Water Line from the upper side of London bridge to Westminster bridge is generally level, unless influenced by winds and land floods. The time of High Water is about 10 minutes earlier at London than Westminster bridge.

| | in. pts. | | | min. | |
|---|---|---|---|---|---|
| The mean Low Water Line has a fall of | 4. 0. | from Westminster to Waterloo bridge, | Time | 7 | later at Westminster than at Waterloo bridge. |
| Ditto - - - - - - - - | 4. 3. | from Waterloo to Blackfriars bridge - | - - | 6 | Ditto. |
| Ditto - - - - - - - - | 3. 2. | from Blackfriars to Southwark bridge | - - | 5 | Ditto. |
| Ditto - - - - - - - - | 0. 5. | from Southwark to London bridge | - - - | 4 | Ditto. |
| Total foot - - | 1. 0. 0. | | Total - - | 22 | |

### AREAS of the TRANSVERSE SECTIONS in the River THAMES at LONDON BRIDGE.

---

| | | feet. | in. | pts. | | LONDON BRIDGE. | Abate for Water-works. | Clear Total. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Feet. | Feet. | Feet. |
| At an extraordinary High Water or Level of 2 feet above the average Spring Tide High Water mark, at the Hermitage entrance to the London Docks, as settled by the Corporation of the Trinity House, August 1800 | | | | | | 8,130 | 1,000 | 7,130 |
| At the Trinity High Water Mark, or | | | | | Datum | 7,360 | — | — |
| At an average Spring Tide High Water | below bridge, or level of | 0. | 6. | 5. | under the Datum | 7,122 | 850 | 6,272 |
| At - - Ditto Spring Tide High Water | above bridge, or level of | 1. | 2. | 0. | Ditto | 6,837 | 810 | 6,027 |
| At - - Ditto Neap Tide High Water | above bridge, or level of | 4. | 3. | 0. | Ditto | 5,293 | 600 | 4,693 |
| At - - Ditto Spring and Neap Tide Low Water | above bridge, or level of | 14. | 5. | 0. | Ditto | 1,488 | - - - | 1,488 |
| At - - Ditto Neap Tide Low Water | below bridge, or level of | 16. | 5. | 0. | Ditto | 1,030 | - - - | 1,030 |
| At - - Ditto Spring Tide Low Water | below bridge, or level of | 18. | 9. | 0. | Ditto | 540 | - - - | 540 |

### At SOUTHWARK, BLACKFRIARS, WATERLOO, and WESTMINSTER BRIDGES.

| | Southwark Bridge. | Blackfriars Bridge. | Waterloo Bridge. | Westminster Bridge. |
|---|---|---|---|---|
| At the above level of extraordinary High Water | 15,260 | 15,460 | 19,882 | 16,750 |
| At the Trinity High Water Mark, or Datum | 13,940 | 14,117 | 17,707 | 15,198 |
| At an average Spring Tide High Water, or level of 1 foot 2 inches under the Ditto | 13,170 | 12,975 | 16,447 | 14,015 |
| At - - Ditto Neap Tide High Water, or level of 4 feet 3 inches under the Ditto | 11,135 | 10,590 | 13,116 | 11,380 |
| At - - Ditto Spring and Neap Tide Low Water | 5,012 | 3,724 | 3,382 | 3,720 |

London, 12th March 1821.

## Appendix, No. 4.

Appendix, N° 4.

Opinions of Dr. Hutton, and the Harbour Master of the Port of London, as to the Effects that an Enlargement of the Waterway under London Bridge would have upon the Depth and Navigation of the River Thames.

Dr. Hutton.

Question 1.—If London bridge shall be taken down, or the smaller arches enlarged, so as to admit the free passage of the water, would the tides, particularly spring tides, have the effect of overflowing, or otherwise be injurious to the wharfs situated above bridge, between London and Westminster bridges, or from the former to Vauxhall, Putney, or Richmond bridges?

Answer.—The enlargement of the waterway at London bridge, by either of the two methods mentioned in this query, would doubtless produce the following effects:—the flood tide meeting little or no obstruction there, would flow up in the natural way, as in all other parts of the river, filling every part of it above bridge sooner and more uniformly in its progress, and also flow much higher up the river than at present. The ebb tide would commence at the same time as now, but would continue to ebb a little longer than at present. There being no obstruction above bridge to the natural flow of the tide, none of the wharfs can possibly suffer any inconvenient flow or depth of water at any time whatever. It is my decided opinion, then, that the wharfs, and the whole of the river above bridge, will be greatly benefited by the proposed change, as the flood will ascend higher up the river, and the wharfs will have their usual depth of water during a longer length of time.

*Chas Hutton.*

Question 2.—If the removal of London bridge, or widening the smaller arches, would have the effect of being injurious to the navigation above bridge, by leaving the bed of the river partially dry or deficient in the necessary supply of water, it being considered that London bridge, in its present state, acts as a dam to retain the water, particularly at neap tides?

Answer.—I am clearly opinion, that the enlargement of the waterway can be no way injurious to the navigation above bridge, as the water will ebb nearly the same as at present, the decrease in width at present being compensated by the greater depth and velocity through the arches.

*Chas Hutton.*

Question 3.—Under any circumstances will it be necessary to add further embankments to the river, or occasion any additional expenditure beyond that of rebuilding the bridge on its present site, or enlarging the arches, should that measure be preferred?

Answer.—Under any circumstances of the proposed alterations of the bridge, I do not think it at all necessary to add further embankments to the river, or to incur any additional expenditure beyond that of rebuilding the bridge on its present site, or of enlarging the arches. *Chas Hutton.*

Bedford-row, June 19, 1819.

To the Worshipful Port of London Committee.

Gentlemen,

Harbour Masters.

We, the undersigned Harbour Masters of the Port of London, in obedience to the order of your Worshipful Committee of the 2d ult. to take into consideration the following Questions, viz.

"What, in their opinion, will be the effect on the navigation of the river between London bridge and Bugsby's Hole, in the event of the removal of London bridge, or the enlargement of the water-way there? And what, in the event of such removal, will be the effect on the navigation upwards?"

Having deliberately considered and maturely weighed the same, beg leave to report our opinion, as follows:—

London bridge, by its confined arches, prevents a great body of water from flowing upwards, the water below the bridge having generally fallen two feet before it becomes level, and the stream ceases to run up; were there no impediment to the free influx of the tide, it would continue its course far above its present limits, and by such an increased quantity of water having to return down on the reflux or ebb, with an uniform sweep over the whole breadth of the river, and with an increased velocity, would, in our opinions, have the effect of gradually deepening and scouring the whole bed of the river, and assist much in clearing the knowls and shoaler parts, and materially improve the navigation downwards.

We are further of opinion, that during severe frost, the ice, by meeting less obstruction, would pass more freely, and would not accumulate in such large masses as it hitherto has, owing to the stoppage at the bridge; and the navigation for craft upwards would remain much longer open.

In the event of the enlargement of the water-way at the bridge, we think that the benefit to the navigation of the river, from the before stated causes, will be in proportion to the extent of such enlargement.

With respect to the last question, regarding the effect on the upper navigation; from the little intercourse we have with that part of the river, we do not feel so competent to form an opinion; but we think were the bridge removed, there would at first arise some inconvenience from the decrease in the depth of the river at low water; at the same time we consider, that the navigation will not be injured by it, inasmuch as the barges which may be detained

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detained at Westminster, or Chelsea Reach, bound upwards, have to wait a considerable time for the tide rising so much below bridge, before the stream makes upwards. If the obstruction were removed, the tide above bridge would flow so much sooner, and arrive at the same height at a given point in a shorter period of time than it does at present, and assisted by the increased rapidity of the stream, it would convey the barges a greater distance in the same space of time, and the increased body of water would tend much to scour and deepen the bed of the river, and in time form a channel for the barges and craft to navigate downwards nearly the whole of the ebb tide.

All which we beg leave to submit to your Worshipful Committee.

We have the honour to remain, gentlemen,
Your obedient humble servants,
*Anthony Ludlam*, *Thoˢ Wake*,
*H. B. Woodhouse*. *John Fisher*.

To the Worshipful Port of London Committee.

Harbour Masters.

Gentlemen,

In compliance to your orders of the 2d June, requesting a board of harbour masters to be assembled, and to suggest what would be the probable effect on the navigation of the river between London bridge and Bugsby hole, in the event of the removal of London bridge, or the enlargement of the water-way there; and what, in the event of its removal, would be the effect on the navigation upwards.

In reply to the foregoing questions, I shall confine myself to what, in my opinion, would be the natural result, and so far as my own knowledge and experience extends, without presuming on the better intelligence of others. The entire removal of the bridge in question would not, according to my ideas, be attended with any material consequence below the bridge, nor would it increase the force of tide to that degree as to endanger the shipping at their moorings, or to be the means of racing away or removing the shoals and banks hove up by eddies and grounding of laden ships in certain parts of the river, between the bridge and Pitcher's Point; the strength of the stream would be more diffusive and regular, and certainly would give facility to the navigation. It would make a free, open, and easy access and egress for craft of all descriptions; also sailing barges and small square-rigged vessels to load and discharge at wharfs, and consequently induce the trade higher up the river, encourage coasters and warehousing, and clear away the crowded parts of the river from the small sailing craft, &c. But the effect in winter of accumulated quantities of drift ice would no doubt, endanger the shipping in general at their moorings; a considerable part of which danger is now impeded above bridge, and stopped in its course downwards, and so *vice versa*. It will be efficacious in removing the objections complained of as to the annual loss of lives and property. How far its entire removal may prejudice the navigation above bridge, is matter, in my opinion, of speculation; as it refers to a decrease, or is productive of shallowness at low water, so it will equally produce an earlier flow or swell of tide at flood, and so on alternately. Its natural height at full and change of the moon will not be materially altered, no more than in common tides. But I should think it would be extremely difficult, even for ballast lighters, to clear away remaining obstructions on the bed of the river, that might be dangerous in many respects. A large and more extended water-way at London bridge, could, in my opinion, be effected with much less comparative expense, and obviate many difficulties now complained of as to the loss of lives and property, as it will also remove the great fall of water there at certain times of tide, that renders it so dangerous for loaded craft to shoot the bridge. But it must be wide and spacious, so as to admit several craft abreadth to pass with ease and facility, which will also lessen the rapidity of the great indraught of the bridge, and prevent all accidents, provided the crafts have proper and sufficient help and assistance to manage, and skill to conduct them, when exposed by strong winds to damage and various hazards. I am of opinion, that a large and more extended water-way will also add strength and security to the bridge, as in a great degree to remove present serious apprehensions from the rapidity of the tide, with the land floods and ice in winter, which a very narrow and contracted pass way must occasion.

It is evident, that whatever tends to facilitate the free and uninterrupted course of the tide, will also remove many obstructions, and must equally tend to dissipate apprehensions, and give security to the present dubious state of the bridge.

The waterway being enlarged, and interruptions cleared away, will also cause a more regular stream, and considerably lessen the head of water that forms now a dangerous rapid, with whirlings and eddies that cannot be resisted.

It will certainly cleanse and scour away the shoals by the stream of tide on the bed of the river, in the range of the great arch, and so far as its width extends.

The utility of an open and extended water-way is corroborated by late experiments on the construction of bridges extant in these modern times; and a spacious middle arch assimilates nearly to those principles the latest architects have adopted, which is generally admitted as the most approved plan for general purposes and utility.

It is but reasonable to suppose, in regard to the upper navigation of the river, that if, by widening the influx, a greater and quicker flow of tide is procured higher up the river, by the same rule, a lower fall of tide and shallower depth at low water will be the consequence, provided no obstruction in the bed of the river remains after the alteration takes place.

The craft navigating above bridge cannot be much affected by the change, for if they are retarded one way, they will be expedited the other; and as those two positions are in conformity to the common course of things, I cannot think it will have any material bearing as to the main object, being that of widening the passages of the bridge, and removing the great fall.

Certainly the rapidity of spring ebbs in winter would be much increased by the land floods, and breaking up of hard frosts, so as not entirely to exclude the possibility of a considerable rapid in the main arches; but this, I think, can be materially obviated by an adherence, in the first instance, to the attainment of the widest spaces possible, upon the most solid basis, with least starling obstruction.

I am hardly capable to say what inconveniences would occur by the event at the above stated periods to Blackfriars bridge, whether by removing one objection, it might not create another. But the river being wider above, and the archway larger, it might not be worthy of any consideration. I cannot further enlarge on the effect of a spacious and greatly extended waterway at London bridge before stated, more than to give it my decided opinion generally.

That it would be a plan of the greatest utility, upon the most economical principles; that whilst it so eminently tended to remove a considerable part of the loss, damage, and inconvenience complained of, it would dissipate the present groundless apprehensions of its insecurity, improve its stability, and support and strengthen the foundational parts of the bridge, by conveying the force of the stream, and of all floats, in its vortex, clear of danger to the bridge, its base, and fabric.

I am, with profound respect, gentlemen, your very humble servant,

*Alex. Murray.*

Greenwich, July 5, 1820.

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## Appendix No. 5.

EXTRACTS from the Proceedings of the Committee for letting the Bridge House Estates, relative to London Bridge.

At a Select Committee for letting the Bridge House estates, held at Guildhall, on Monday the 12th day of March 1821.

The clerk of the works delivered in a report of himself, Mr. Rennie, Mr. Chapman, and Mr. James Mountague, on the expediency of enlarging the waterway under London bridge, in the manner recommended by Mr. Dance and others, in the year 1814, which was read.

Whereupon after debate, It is ordered, That Mr. Rennie and Mr. Chapman, be requested to attend this committee on Wednesday next, at 11 o'clock.

At a Select Committee for letting the Bridge House Estates, held at Guildhall, on Wednesday the 14th day of March 1821.

Mr. Rennie and Mr. Chapman attended the committee, on the subject of their report of the 12th of March instant, when, in answer to questions put to them by the committee, Mr. Rennie stated, that he had formerly considered, that there was a difference of two feet in the height of the tide above and below bridge, but he had so considered it from information, and not from actual measurement made by himself; that when the reference was made to him and others by this committee, it was deemed necessary that a person should be employed to take all the actual levels and soundings from the time the reference was made, until the report was nearly ready, which had been accordingly done by Mr. Giles, under the direction of Mr. James Mountague; that he has frequently employed Mr. Giles upon such occasions, and he has no doubt of the accuracy of his result; that the difference of level was only eight inches. Mr. Kitching, the tide carpenter at London bridge, had also been employed by Mr. James Mountague, unknown to Mr. Giles, to take the rises of the tide above and below the bridge, and it appears that his account corresponds very closely with that of Mr. Giles, and that there is no instance where the two accounts, on the average, differ more than two or three inches. It is therefore evident, from the observations made by Mr. Giles, that in ordinary spring tides, there will be a rise of eight inches, if the bridge was removed; but it is not that difference of tide, in ordinary cases, that will materially affect the wharfs and buildings above the bridge; but it is in extraordinary cases, which he would endeavour to explain, *viz.* when a strong east or north easterly wind blows for a period of ten days, a fortnight, or three weeks, a large quantity of water is blown through the straits of Dover, and is heaped up on the south coast of England, as well as the north coast of Scotland; if the wind changes suddenly to the west, the water so heaped up at both extremities returns, and meeting on the east coast of England, forces a large body of water up the river Thames, and occasions an extraordinary rise in the river of several feet; but with reference to such a tide, he conceived the removal of the bridge would be a great good instead of an injury.

The bridge prevents the freshes, or land waters, from wholly flowing out with the ebb tide; and consequently on the return of flood, the quantity of water thrown up by the tide increases the height; but if the arches of the bridge were enlarged, or a new bridge built, the accumulated water above would be carried off every tide.

Though there might be eight inches higher flow in ordinary spring tides, and some increase in extraordinary tides, yet there would be fewer of them, since there would not be that accumulation of water or ice above as there now is.

Taking an average of the river floods and high tides that would then take place during the year, he was quite satisfied the wharfs would not be so frequently injured as they now are.

He had surveyed the river Rother, which passes through a part of Romney Marsh, some years since, the water of which was very shallow, and in Rye harbour there was not more water at certain times than about a foot; a sluice upon the Rother was blown up, and the water flowed up the river for several miles; the consequence was, that in the course of the winter, the river was deepened by nearly three feet, and no artificial means had been used during that time, and he has no doubt the result would be similar in the river Thames; and he expected, that with ballasting the hard shoals, the river would be deepened in the conrse of time nearly three feet at the Southwark bridge; he could mention many instances where a similar effect had been produced upon rivers.

Instead of the irregular tide which now takes place, there would be a regular tide, and the owners of wharfs near the bridge would derive great benefit, for barges cannot now get above London bridge at low water, but must wait until the water has risen to the level of that above bridge; but were the arches to be enlarged, or a new bridge built, it would not be necessary, as the barges and craft would move upwards early in the flood. The bottom of the river would be deepened annually, and instead of loss of time being occasioned, it would be the reverse, for the water near the wharfs would also be deep, and the barges would be able to remain longer alongside, and consequently there would be more time for loading and unloading them; and he was upon the whole clearly of opinion, first, that the overflows above the bridge would not be so frequent as they are now; and, secondly, that the general navigation would be improved.

Mr. Chapman stated, that he perfectly coincided with the whole that Mr. Rennie had stated; and that he was persuaded, that so far from the navigation from the bridge westward, as far as the tide will flow upwards, being injured by the enlargement of the water-way at the bridge, it would be greatly improved, because barges would be aided by the greater velocity of the tide, and further extent of its flow, as well as by the greater depth of the channel obtained, and consequently must proceed with greater facility than they do at present, unaided by that velocity and depth. He also observed, that in a channel comparatively wide to the depth of water flowing through it, the bottom of that channel would not essentially, or might not at all, wear away from any moderate increase of velocity occasioned by removal of obstacles to its outlet; but that if a passage were excavated through it by ballast lighters, the current would then be able to widen its channel.

The committee then proceeded to consider the report of the surveyors and engineers presented to this Committee at their last meeting.

Whereupon, after debate, it is resolved, That it is the opinion of this committee, that the said report should be forthwith presented to the court of common council.

And it is Ordered, That a Report thereof be prepared.

Sub Committee Bridge House Estates,
Monday, 19th March 1821.

A REPORT from the Select Committee, on the subject of the Petition of the Owners of Coal Craft, and others, for an Enlargement of the Waterway under London Bridge; was delivered in and read, in these words:

To the Worshipful Sub Committee for letting the Bridge House Estates.

Pursuant to your order of the 27th day of April last, we have proceeded to consider the best means of remedying the inconveniences occasioned by the present contracted state of the waterway through London bridge; and it appearing to us, that any alteration of the waterway, with a view to remedy the inconveniences complained of, would materially affect the motive power of the water works, we deemed it expedient, in the first instance, to consider the means by which that difficulty might be overcome; we have, accordingly, held several conferences with the managers of those works, and have entered into a negotiation upon the subject, which we have every reason to believe will, within a short period of time, be so far concluded, as to be in a proper state to be reported to the court of common council.

We have also attentively considered the mode of enlarging the waterway proposed by Messrs. Dance, Chapman, Alexander, and James Mountague, in their report made in November 1814; but, as it is a subject of the most serious importance, and as no estimate has been made of the expense of the alteration proposed in that report, we thought it necessary that a further opinion should be taken; we therefore referred it to the clerk of the works, Mr. John Rennie, Mr. William Chapman, and Mr. James Mountague, to consider and report, whether the mode of enlarging the waterway, recommended in the report before mentioned, would, in their opinion, under all the circumstances of the case, with reference to expense and subsequent stability, be more expedient than the erection of a new bridge.

We have since received such report, which we have caused to be printed in an Appendix to the abstract of proceedings relative to the bridge.

We are proceeding further in the reference made to us; but, although we have not yet formed any opinion on the subject of the said report, we deem it expedient that the same should be forthwith presented to the court of common council; all which we submit to the consideration of this worshipful committee. Dated this 17th day of March 1821.

And the same being agreed to, it is ordered that a report thereof be prepared.

A report thereof was then read, and signed.

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Committee Bridge House Estates,
Thursday, 19th March 1821.

A REPORT from the Sub Committee, on the Petition of the Owners of Coal Craft, and others, for an Enlargement of the Waterway under London Bridge, was delivered in and read, in these words:

To the Worshipful Committee for letting the Bridge House Estates.

Pursuant to your order of the 12th day of February 1819, we have examined the allegations contained in the petition of the several owners of coal craft upon the river Thames, for an enlargement of the waterway under London bridge; we have viewed the bridge, and have heard several witnesses, produced by the petitioners in support of their petition; and as it became necessary, attentively to examine and consider the proceedings relative to the bridge, taken by the honourable the House of Commons, and your committee, during the last twenty years; we caused an abstract of such proceedings to be printed for our use, together with a sufficient number for the use of the court of common council; to which is added the evidence, and several documents which have since been submitted to our consideration in the course of our inquiry, under the before-mentioned reference, a copy whereof is delivered herewith; and, after full consideration of the subject, being of opinion that the contracted state of the waterway through the bridge is productive of great loss of time, property, and life; and that it was expedient to consider the best means of preventing such loss, we referred it to a select committee, to consider the best means of remedying the inconveniences complained of, and to inquire, if necessary, into the obstacles that might arise from the London bridge water works, or otherwise.

That the select committee have since delivered in a report to us, which is annexed hereto [see foregoing report]; and we, agreeing with the select committee in their report, submit the same to the consideration of this worshipful committee. Dated this 19th day of March, 1821.

And the same being agreed to, it is ordered that a report thereof to the court of common council be prepared.

A report thereof, to the court of common council, was then read, and signed.

Committee Bridge House Estates,
24th March 1821.

AN Order of the Court of Common Council, to consider the Report of the Clerk of the Works, and others, relative to London Bridge, was delivered in and read, in these words:

Thorp, Mayor.—A common council, holden in the chamber of the Guildhall of the city of London, on Thursday, the 22d day of March, 1821;

Resolved, that it be referred to the committee for letting the Bridge House estates, to consider the report of the clerk of the city's works, Mr. Rennie, Mr. Chapman, and Mr. James Mountague, with full powers to take such measures as may be deemed expedient, to enable the committee to form an opinion on the best means of remedying the inconveniences occasioned by the present contracted waterway through the bridge, and to report thereon from time to time as there shall be occasion.

John Carter,
Clerk to Court of Common Council. } *Woodthorpe.*

Whereupon, it is referred to the select committee appointed to attend to the proceedings of the select committee of the honourable the House of Commons, in relation to London bridge, to consider the said report, with full powers to take such measures as may be deemed expedient to enable them to form an opinion on the best means of remedying the inconveniences occasioned by the present contracted waterway through the bridge, and to report thereon from time to time, as there shall be occasion.

Select Committee Bridge House Estates,
Thursday, 5th April 1821.

It is ordered, that the clerk of the works do prepare and lay before this committee a statement of the means and expense of examining the state of the piles under the piers of long entry or narrow passage lock.

Select Committee Bridge House Estates,
Saturday, 7th April 1821.

A REPORT of the Clerk of the Works, of the Means and Expense of examining the state of the Piles under the Piers of Long Entry or Narrow Passage Lock, was delivered in and read, in these words:

To the Worshipful Select Committee Bridge House Lands.

Gentlemen,

Pursuant to your order of the 5th instant, whereby I was directed to prepare, and lay before this committee, a statement of the means and expense of examining the state of the piles under the piers of long entry or narrow passage lock, I beg leave to state, that a dam having been formerly placed on the upper side thereof, when the bottom of the lock was raised, facility of damming is easily afforded, so as to enable an inspection of the state of the piles, as far as the tide will ebb, it will be necessary when the dam is completed, to cut away part of the timbers of the starlings, between the lock and the piers. The whole expense I have estimated at the sum of thirty pounds.

Guildhall, 7th April, 1821. I am, gentlemen, your obliged faithful servant,
*Wm Mountague*, Clerk of the City's Works.

The committee then proceeded to consider the report of the clerk of the works and others, relative to the bridge;

Whereupon, after debate a motion was made and question put,

That upon consideration of the precarious result of improving the present bridge, and of the advantages likely to accrue to the city, from the erection of a new one, it is the opinion of this committee, that on condition that parliamentary assistance can be obtained in aid of the bridge house funds, a new bridge should be erected.

Upon which, an amendment was moved and seconded,

That although it is the opinion of this committee, that a new bridge would be the most eligible mode of remedying the inconveniences complained of by the petitioners, yet when it is considered, that an expense greatly beyond the means of the bridge house funds, must be incurred in the erection of a new bridge, with the necessary approaches, which must therefore be provided for, either by tolls or a charge on the orphans fund, against the former of which, we entertain great objections, and against the latter, we fear objections may be made in Parliament, and that so little is necessary to be done to answer the purpose of the petitioners, that the construction of only two arches would effect that purpose, it is the opinion of this committee, that provided it shall appear on examination, that the piles under the piers of the bridge are in a state to bear the additional weight which the piers will have to sustain, and that the examination can be made at a moderate expense, it will be expedient first to proceed to remove the waterworks, and then to adopt either the whole or part of the plan recommended by Messrs. Dance and others in their report, dated November 1814, as upon further consideration may be deemed advisable, in constructing arches of a sufficient size to afford the convenience required for the purposes of the navigation, which plan is within the means of the bridge house funds, and will prevent, by a gradual enlargement of the waterway, any ill consequences which might be apprehended from the water overflowing the banks of the river, in consequence of a sudden removal of the dam.

And the question being put, the amendment was resolved in the affirmative.

And it is ordered, that a report thereof be prepared.

Select Committee Bridge House Estates.
Monday, 9th April 1821.

A REPORT relative to the enlargement of the waterway through London bridge, was read.

And after debate, a motion was made and question put, That such report be now signed; upon which, an amendment was moved and seconded, that this committee do adjourn until Wednesday next, at ten o'clock; and the question being put, the amendment was resolved in the affirmative.

It is ordered, that Captain Anthony Ludlam, one of the harbour masters, be requested to attend the next meeting of this Committee.

Select Committee Bridge House Estates,
11th April 1821.

Captain Anthony Ludlam, one of the harbour masters, attended; and in answer to questions put to him by the committee on the subject of the enlargement of the water-way through London bridge, stated that he had held the appointment of harbour master for 22 years; that he was of opinion, that if a new bridge were so constructed as to allow vessels to pass through, which are now prevented, and some little pains taken to deepen the river, a great deal of trade now carried on below the bridge would be transacted above it.

The description of trade alluded to, is that from vessels which now discharge their cargoes at Pickle Herring wharf, and the neighbourhood of the Tower, and the Newcastle vessels with iron, earthenware, &c. would then go alongside the wharfs above the bridge.

If there were more water-way, the tide would flow more up and down, and sweep and deepen the bed of the river, and keep it so. He was of opinion, that it would improve the navigation upwards, and that the banks of the river would not be overflowed; and the more the water-way were enlarged, the greater would be the advantage to the navigation.

A report relative to the enlargement of the water-way under the bridge, was then read and signed.

Thorp, Mayor.—A common council, holden in the chamber of the Guildhall of the city of London, on Thursday the 12th day of April 1821.

The committee for letting the bridge house estates, did this day deliver unto this court, a report

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a report in writing, under their hands, for rebuilding London bridge, which was read in these words:—

To the Right Honorable the Lord Mayor, Aldermen and Commons of the City of London, in Common Council assembled.

We, whose names are hereunto subscribed, your committee for letting the bridge house estates, do certify, that by an order of this honourable court, of the 11th day of February 1819, it was referred to us to examine the allegations in the petition of the several owners of coal craft, and other owners and navigators of craft upon the river Thames, for an enlargement of the water-way under London bridge, with power to confer with His Majesty's ministers, if we should see occasion; and by another order of this honourable court, of the 22d day of March last, it was referred to us to consider the report of the clerk of the works, Mr. Rennie, Mr. Chapman, and Mr. James Mountague, on the subject of the bridge, with full powers to take such measures as might be deemed expedient, to enable us to form an opinion on the best means of remedying the inconveniences occasioned by the present contracted water-way through the bridge, and to report thereon from time to time, as there should be occasion; we referred the same to a select committee, who have since reported, that it appearing to them, that the revenue arising from the bridge house estates, is by no means sufficient to defray the expense of the erection of a new bridge, they deemed it expedient to hold a conference with His Majesty's ministers on the subject, and appointed a deputation for the purpose, who had reported, that they had accordingly held a conference on the 30th of March last, with the Right honourable the Earl of Liverpool and the Right honourable Nicholas Vansittart, and were attended by Mr. Remembrancer, Mr. Comptroller of the bridge house, the clerk of the works, and Mr. James Mountague, when having stated the various proceedings which have taken place with respect to the bridge, and that a sum sufficient to defray the expense of a new bridge, could not be raised upon security of the bridge estates, the deputation requested to be informed, whether His Majesty's ministers would (in the event of its being deemed expedient that a new bridge should be erected) sanction the appropriation of a portion of the public revenues to such purpose, when Lord Liverpool stated, in most decided terms, that no such sanction would be given. His Lordship and Mr. Vansittart, after some general discussion, expressed their opinion, that a sum of money might with justice and propriety be raised for the purpose by the means of tolls.

That the select committee had since most attentively considered the subject, and although it was their opinion, that a new bridge would be the most eligible method of remedying the inconveniences complained of by the petitioners, yet when it is considered, that an expense greatly beyond the means of the bridge house funds, must be incurred in the erection of a new bridge, with the necessary approaches, which must therefore be provided for, either by tolls or a charge on the orphans fund; against the former of which they entertained great objections, and against the latter they feared objections might be made in Parliament; and that so little is necessary to be done to answer the purpose of the petitioners, that the construction of only two arches would effect that purpose. The select committee were of opinion, that provided it shall appear on examination, that the piles under the piers of the bridge are in a state to bear the additional weight which the piers would have to sustain, and that the examination can be made at a moderate expense, it will be expedient, first, to proceed to remove the waterworks, and then to adopt either the whole or part of the plan recommended by Mr. Dance and others in their report, dated November 1814, as upon further consideration may be deemed advisable, in constructing arches of sufficient size to afford the convenience required for the purposes of the navigation; which plan is within the means of the bridge house funds, and will prevent, by a gradual enlargement of the water-way, any ill consequences which might be apprehended from the water overflowing the banks of the river, in consequence of a sudden removal of the dam.

We have considered the report of the select committee with the greatest attention, and after mature deliberation, and considering the difficulty of estimating the expense of the proposed alteration of the bridge, as well as the precarious result of such alterations when effected, together with the honour and advantage which must accrue to the city of London from the erection of a new bridge, we recommend the latter as the most expedient measure, provided parliamentary assistance can be obtained in aid of the bridge house funds. But that, should such aid be refused, we shall then be compelled to advise, that such improvements of the present bridge be resorted to, as can be provided for from the funds under our management. All which we submit to the judgment of this honourable court. Dated this 12th day of April 1821.

*C. Smith*, Chairman.
*Samuel Favell.*
*H. Dibbin.*
*John Locke.*
*William Rawlins.*
*Matthias Prime Lucas.*
*Samuel Joyce.*
*John Lorkin.*
*Samuel Wilson.*
*Thomas Crokatt.*
*John Smith.*
*William Richardson.*
*Perrot Fenton*, jun.

And a motion being made, and question proposed, that this court doth agree with the committee in their said report, an amendment was moved, by leaving out all the words from the words "with the," and substituting the following in lieu thereof; *viz.* " report of the select committee, as set forth in the said report, and that it be referred back to the committee for letting the bridge house estates, to take such measures thereon as they may be advised, and to

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to report from time to time to this court;" and on the question being put, the lord mayor declared the same to be carried in the affirmative; and a division being demanded and granted, there appeared 72 commoners, besides the 2 tellers, for the affirmative, and 14 commoners, besides the 2 tellers, for the negative. Whereupon it was resolved, that this court doth agree with the report of the select committee, as set forth in the said report, and that it be referred back to the committee for letting the bridge house estates, to take such measures thereon as they may be advised, and to report from time to time to this court.

*Woodthorpe.*

John Carter,
Clerk of the Common Council.

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## Appendix, No. 6.

Return to an Order of the Select Committee of the House of Commons on London Bridge, dated the 12th July 1820;—for

An Account of all the Stone or Rubble thrown into the River Thames, for the protection of the Starlings of London Bridge, during the last 20 Years, specifying the Dates and Quantities.

| | Tons. | | Tons. |
|---|---|---|---|
| 1799 - - - - - | 1,120 | 1811 - - - - - | 581 |
| 1800 - - - - - | 1,027 | 1812 - - - - - | 407 |
| 1801 - - - - - | — | 1813 - - - - - | 471 |
| 1802 - - - - - | 515 | 1814 - - - - - | 330 |
| 1803 - - - - - | 172 | 1815 - - - - - | 138½ |
| 1804 - - - - - | 290 | 1816 - - - - - | 253 |
| 1805 - - - - - | 391 | 1817 - - - - - | 432 |
| 1806 - - - - - | 415 | 1818 - - - - - | 264 |
| 1807 - - - - - | 558 | 1819 - - - - - | 260 |
| 1808 - - - - - | 451 | | |
| 1809 - - - - - | 785 | Tons | 9,588½ |
| 1810 - - - - - | 728 | | |

Office of Works, Guildhall,
20th July 1820.

*James Mountague,*
Superintendent of the Repairs of London Bridge.

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## Appendix, No. 7.

Coroner's Returns of Inquests taken on Persons drowned in passing or attempting to pass through London Bridge, from the Year 1800 to 1820, inclusive.

| | London and Southwark. | Surrey. | Kent. |
|---|---|---|---|
| 1800 - - - | 1 | 1 | The present coroner has held his situation for seven years and three months, during which time no inquest above alluded to has been held. |
| 1801 - - - | 1 | — | |
| 1802 - - - | 1 | 1 | |
| 1803 - - - | — | — | |
| 1804 - - - | 1 | — | |
| 1805 - - - | — | — | |
| 1806 - - - | — | — | |
| 1807 - - - | — | — | |
| 1808 - - - | — | 1 | |
| 1809 - - - | 3 | — | |
| 1810 - - - | — | — | |
| 1811 - - - | 1 | — | |
| 1812 - - - | — | — | |
| 1813 - - - | — | — | |
| 1814 - - - | — | — | |
| 1815 - - - | — | — | |
| 1816 - - - | 2 | — | |
| 1817 - - - | 1 | — | |
| 1818 - - - | 1 | — | |
| 1819 - - - | 1 | 1 | |
| 1820 - - - | — | 1 | |

## Appendix, N° 8.

Appendix, N° 8.

AN ACCOUNT of the Produce of the Bridge House Estates, and of the Application thereof for the Repairs of London Bridge and otherwise, from the year 1798 to the year 1818; in continuation of an Account laid before the Committee of the House of Commons upon the Improvement of the Port of London, in the year 1799.

### From Christmas 1798 to Christmas 1799.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, and casual receipts | | | | 10,797 | 12 | 10½ |
| Payments for the repair and support of London bridge | £. 3,504 | — | 4 | | | |
| Charges and expenditure on account of the Bridge House estates, including 2,714 *l.* 7 *s.* 8 *d.* paid for the redemption of land tax, | 7,089 | 12 | —¼ | | | |
| Application | | | | 10,593 | 12 | 4¼ |

In the warden's account, accompanying the rental for each year, the balance is stated, and carried on progressively from year to year.

### From Christmas 1799 to Christmas 1800.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents and dividends | | | | 10,182 | 16 | 1 |
| Payments for the repair and support of London bridge | £. 2,652 | 18 | 6½ | | | |
| Charges and expenditure on account of the Bridge House estates, including 6,079 *l.* 14 *s.* 1 *d.* paid for the redemption of land tax, | 10,264 | 5 | 6½ | | | |
| Application | | | | 12,917 | 4 | 1 |

### From Christmas 1800 to Christmas 1801.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents and dividends | | | | 12,335 | 19 | 8½ |
| Payments for the repair and support of London bridge | £. 1,588 | 11 | 2 | | | |
| Charges and expenditure on account of the Bridge House estates including 5,823 *l.* 9 *s.* 6¼ *d.* paid for the redemption of land tax | 11,484 | 10 | 10¼ | | | |
| Application | | | | 13,073 | 2 | —¼ |

### From Christmas 1801 to Christmas 1802.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, casual receipts, and sale of land to the Grand Surrey Canal Company, including 3,000 *l.* borrowed from the Chamberlain of London, | | | | 15,909 | 16 | 1¼ |
| Payments for the repair and support of London bridge | £. 1,455 | 4 | 6 | | | |
| Charges and expenditure on account of the Bridge House estates, including 6,441 *l.* 13 *s.* 6¾ *d.* paid for the redemption of land tax, and 886 *l.* (the purchase money received from the Grand Surrey Canal Company) invested in 1,257 *l.* 1 *s.* 6 *d.* three per cent consolidated bank annuities | 14,912 | 19 | 10¾ | | | |
| Application | | | | 16,368 | 4 | 4¾ |

### From Christmas 1802 to Christmas 1803.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, and casual receipts, including 14,265 *l.* 15 *s.* received from the Chamber of London, 4,000 *l.* borrowed from the Chamberlain of London, and 14,141 *l.* 13 *s.* 6 *d.* received by the sale of 25,000 *l.* three per cent consolidated bank annuities | | | | 43,785 | 5 | 5¼ |
| Payments for the repair and support of London bridge | £. 3,169 | 11 | 5 | | | |
| Charges and expenditure on account of the Bridge House estates, including 3,387 *l.* 14 *s.* 7 *d.* paid for the redemption of land tax; 14,265 *l.* 15 *s.* invested in 25,000 *l.* three per cent consolidated bank annuities, and 7,000 *l.* and interest, repaid to the Chamberlain of London | 40,146 | 6 | 10½ | | | |
| Application | | | | 43,315 | 18 | 3½ |

### From Christmas 1803 to Christmas 1804.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, and casual receipts, including 500 *l.* borrowed from the Chamberlain of London | | | | 12,153 | 14 | 3¼ |
| Payments for the repair and support of London bridge | £. 1,838 | 5 | 11 | | | |
| Charges and expenditure on account of the Bridge House estates, | 10,203 | 11 | 11½ | | | |
| Application | | | | 12,041 | 17 | 10½ |

Account of the Bridge House Estates, &c.—*continued.*

| | | | | | | |
|---|---|---|---|---|---|---|
| From Christmas 1804 to Christmas 1805. | | | | £. | s. | d. |
| Produce by rents and dividends | | | | 9,822 | 15 | 7½ |
| Payments for the repair and support of London bridge | £. 2,189 | 12 | 8 | | | |
| Charges and expenditure on account of the Bridge House estates, | 7,859 | 7 | 10 | | | |
| Application | | | | 10,049 | — | 6 |
| From Christmas 1805 to Christmas 1806. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 17,441 | 14 | 11½ |
| Payments for the repair and support of London bridge | £. 3,694 | 2 | 7 | | | |
| Charges and expenditure on account of the Bridge House estates, including 500*l.* and interest, repaid to the Chamberlain of London | 12,867 | 11 | 0½ | | | |
| Application | | | | 16,561 | 13 | 7½ |
| From Christmas 1806 to Christmas 1807. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 13,710 | — | 3 |
| Payments for the repair and support of London bridge | £. 3,642 | — | 6½ | | | |
| Charges and expenditure on account of the Bridge House estates, | 10,716 | 7 | 3 | | | |
| Application | | | | 14,358 | 7 | 9½ |
| From Christmas 1807 to Christmas 1808. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 14,156 | 6 | 1¼ |
| Payments for the repair and support of London bridge | £. 4,557 | 1 | — | | | |
| Charges and expenditure on account of the Bridge House estates, | 10,232 | 18 | 8 | | | |
| Application | | | | 14,789 | 19 | 8 |
| From Christmas 1808 to Christmas 1809. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 13,799 | 19 | 1½ |
| Payments for the repair and support of London bridge | £. 4,336 | 14 | 1½ | | | |
| Charges and expenditure on account of the Bridge House estates, | 9,488 | 7 | 3½ | | | |
| Application | | | | 13,825 | 1 | 5 |
| From Christmas 1809 to Christmas 1810. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 24,402 | 17 | 3¾ |
| Payments for the repair and support of London bridge | £. 6,027 | 13 | 4 | | | |
| Charges and expenditure on account of the Bridge House estates, | 9,199 | 6 | 5¾ | | | |
| Application | | | | 15,226 | 19 | 9¾ |
| From Christmas 1810 to Christmas 1811. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 22,735 | 7 | 1¼ |
| Payments for the repair and support of London bridge | £. 4,229 | 7 | 7 | | | |
| Charges and expenditure on account of the Bridge House estates, including 59 *l.* 13 *s.* 9 *d.* paid for the redemption of land tax, and 5,200 *l.* paid for the purchase of premises in Tooley-street, | 16,053 | 8 | 9¾ | | | |
| Application | | | | 20,282 | 16 | 4¼ |
| From Christmas 1811 to Christmas 1812. | | | | £. | s. | d. |
| Produce by rents, dividends, and casual receipts | | | | 21,921 | 14 | 11½ |
| Payments for the repair and support of London bridge | £, 3,622 | 14 | 8½ | | | |
| Charges and expenditure on account of the Bridge House estates, including 241 *l.* 10 *s.* 5 *d.* paid for the redemption of land tax, 10,000 *l.* paid into the chamber of London, and 5,173 *l.* 14 *s.* 6 *d.* paid for the purchase of premises in St. Paul's churchyard | 23,388 | 5 | 3½ | | | |
| Application | | | | 27,011 | — | — |

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Account of the Bridge House Estates, &c.—*continued.*

### From Christmas 1812 to Christmas 1813.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, interest, and casual receipts - - - - - - | | | | 20,253 | 10 | 1 |
| Payments for the repair and support of London bridge - - | £.3,084 | 9 | 11½ | | | |
| Charges and expenditure on account of the Bridge House estates, | 10,035 | 2 | 10½ | | | |
| Application - - - - - - - - | | | | 13,119 | 12 | 10 |

### From Christmas 1813 to Christmas 1814.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, interest, and casual receipts - - - - - | | | | 22,769 | 12 | 2½ |
| Payments for the repair and support of London bridge - | £.4,225 | 14 | 3 | | | |
| Charges and expenditure on account of the Bridge House estates, including 228 *l.* 10 *s.* 10 *d.* paid for the redemption of land tax, and 14,000 *l.* paid into the Chamber of London - - - | 23,713 | 1 | 8½ | | | |
| Application - - - - - - - - - | | | | 27,938 | 15 | 11½ |

### From Christmas 1814 to Christmas 1815.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, interest, and casual receipts - - - - - | | | | 27,952 | 17 | 1 |
| Payments for the repair and support of London bridge - | £.2,871 | 15 | 8½ | | | |
| Charges and expenditure on account of the Bridge House estates, including 1,100 *l.* paid for the purchase of premises in St. George's fields, 9,000 *l.* paid into the Chamber of London, and 1,663 *l.* 10 *s.* paid on account of the Southwark magistracy, | 22,100 | 8 | 7½ | | | |
| Application - - - - - - - - | | | | 24,972 | 4 | 4 |

### From Christmas 1815 to Christmas 1816.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, interest, and casual receipts - - - - - | | | | 23,659 | 12 | 11½ |
| Payments for the repair and support of London bridge - - | £.4,514 | – | 4½ | | | |
| Charges and expenditure on account of the Bridge House estates, including 350 *l.* paid for the purchase of premises in St. George's fields, 112 *l.* 6 *s.* paid for the enfranchisement of land at West Ham, and 1,789 *l.* 1 *s.* 6 *d.* paid on account of the Southwark magistracy - - - - - - - - - - | 18,866 | 8 | 7½ | | | |
| Application - - - - - - - | | | | 23,380 | 9 | — |

### From Christmas 1816 to Christmas 1817.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, interest and casual receipts - - - - - | | | | 29,229 | 8 | 8¼ |
| Payments for the repair and support of London bridge - | £.3,340 | 1 | 6 | | | |
| Charges and expenditure on account of the Bridge House estates, including 895 *l.* paid for the purchase of premises in Tooley-street, 1,388 *l.* 14 *s.* 6 *d.* paid on account of the Southwark magistracy, and 14,831 *l.* 5 *s.* invested in the purchase of 15,000 *l.* four per cent consolidated bank annuities - - | 31,200 | 15 | 7¾ | | | |
| Application - - - - - - - | | | | 34,540 | 17 | 1¾ |

### From Christmas 1817 to Christmas 1818.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| Produce by rents, dividends, interest and casual receipts - - - - - | | | | 26,526 | 7 | 10½ |
| Payments for the repair and support of London bridge - | £.3,509 | 16 | 8½ | | | |
| Charges and expenditure on account of the Bridge House estates, including 133 *l.* 8 *s.* paid for the purchase of premises in St. George's fields, 2,214 *l.* paid on account of the Southwark magistracy, and 7,580 *l.* invested in the purchase of 8,000 *l.* four per cent consolidated bank annuities - - - - | 21,016 | 14 | 4½ | | | |
| Application - - - - - - - | | | | 24,526 | 11 | 1 |

Bridge House, 16th Dec. 1819.

*John W^m Galabin,*
*Sam^l Thodey* - } Wardens or Keepers of London Bridge.

*Robert Finch Newman,* Comptroller.

The preceding accounts from Christmas 1798 to Christmas 1818, were extracted from the annual accounts of London bridge.

*John Newman,* Assistant Clerk.

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## Appendix, No. 9.

### " DUTIES OF THE SEVERAL BRIDGE HOUSE OFFICERS.

" *Bridge Masters or Wardens or Keepers of London Bridge:*

" To receive the rents and profits of the estates; to pay the salaries and wages of the several officers and workmen, and to make the other necessary disbursements.

" To summon and attend the auditors of the accounts, when required, and all committees; to see that the watchmen and labourers do their duty.

" To attend the lord mayor and court of aldermen on Midsummer and Michaelmas days, and generally to superintend the concerns of the bridge house."

" *Comptroller of the Works and Revenues of London Bridge:*

" To attend all meetings of the court of common council; to cause the committees for letting the bridge house estates to be summoned as often as occasion shall require; to attend all their meetings, either in grand, sub or select committees, and to make such reports as they shall order; to take minutes of their proceedings and keep the journals thereof, and to give notice of their meetings to the several tenants and others whose attendance may be necessary.

" To prepare and arrange, previously to each of their meetings, the reports to be made and signed, and the business to be transacted; to make out all warrants for payment of money for the signature of the committee; and to enter the particulars thereof in a book provided for that purpose.

" In his professional capacity of a solicitor, to manage all suits, conveyancing and other law business, relating to London bridge and the estates thereof.

" To prepare, annually, the rental of the bridge house estates, and to attend the auditors of the bridge house accounts at their several meetings.

" To prepare the leases of the bridge house estates, and the docquets thereof, for the court of common council, the contracts for taking such leases, and the agreements for the admission of tenants at will; and to enter such contracts and agreements in a book for the signatures and execution of the parties.

" To draw, and cause to be inserted in the public newspapers, all advertisements for granting leases of the bridge house estates; for receiving proposals for the supply of timber, &c. and for the performance of works by contract; to prepare such contracts; enter the same in a book for the signatures of the contractors; and to make copies thereof for their use.

" To enter abstracts of all contracts for building and repairing leases, and all orders of the committee to be performed by the clerk of the works in separate books, for his use; to enter all orders of the committee upon the bridge masters, in a book, for their use,

" To enter all grants of leases and admission of tenants at will, all licences to assign or demise, and all alienations by tenants, in a book kept for that purpose, and to take charge of all the title deeds, &c. in the muniment room.

" To extract annually from the rental of the estates, and lay before the committee a particular of all leases nearly expired, and of houses and lands in the occupation of tenants at will; to give notice to the several tenants of the time when they may apply for new leases, and to prepare their petitions accordingly.

" To lay before the committee all orders of reference to them from the court of common council, the bridge master's accounts of rents in arrear, the annual report of the clerk of the works of covenants remaining unperformed, and all other business whatsoever relating to the works and revenues of London bridge, necessary to be submitted to the consideration of the committee.

" To lay before the committee, annually, a statement of the several persons under the control of the committee, holding appointments or collectorships, and giving security, &c.

" To lay before the committee, quarterly, the names of the several persons to whom time may have been given by the committee, for payment of their rents or performance of their contracts.

" To notice all bankruptcies and public sales of leasehold estates, household and other goods and effects, so as to prevent as much as possible the loss of rent in arrear, and the improper alienation of any part of the bridge house estates.

" To confer and advise from time to time with the chairman of the committee, relative to the business depending, and to make proper arrangements with him for transacting the same, and to give to him and the other members of the committee every information required concerning the business of the committee and their proceedings, or the execution and management of the works, revenues and estates of London bridge.

" Generally to attend to the management and execution of the works and revenues of London bridge, and all matters relating thereto; and to submit to the committee, for their consideration, all such measures as may appear benefical to the bridge house estates, and necessary to the due execution of the trusts and purposes thereof."

" *Clerk of the Works:*

" To attend the committee when required; to obey their instructions, make such report as may be ordered, generally to execute the business, whether parliamentary or otherwise, and to attend when necessary upon all arbitrations and trials.

" To make such surveys and valuations of the estates, property and premises, belonging to the bridge house, including London bridge, as may from time to time be required; also of

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of all property intended to be purchased or sold, and to plot and draw plans thereof for any required purpose.

" To make designs, plans, descriptions, estimates, and working drawings for all new buildings intended to be erected; to examine the materials intended to be used therein, and to permit the use of such only as are the best of their respective kinds; to superintend and direct the execution of the works, and to furnish all necessary drawings and instructions for their due performance; to see that they are done in a workmanlike manner, and in conformity to the act of Parliament for the regulating of buildings and party walls, and preventing mischiefs by fire, passed in the 14th year of the reign of George the Third; to measure and value the same; to take the extras and omissions upon all contracts, and to make out detailed accounts of all artificers works done for the bridge house, with the prices affixed to each article respectively, and to certify the amount thereof.

" To make plans, descriptions, estimates, and working drawings for all repairs, alterations, additions or improvements to buildings heretofore erected, and to inspect the materials, superintend and direct the works, measure and value the same, make out detailed accounts thereof, and certify the amounts in the same manner as described to new buildings.

" To particularize and make detailed estimates of the repairs required to be done to the estates, property or premises, belonging to the bridge house, by the tenants thereof, previously to the grant of leases, or upon the renewal thereof, and to produce the same, together with the valuation of the premises, in such manner as may be directed when called for; to see that such covenants are introduced into the leases, as will cause the premises to be kept at all times in good and sufficient repair; to superintend and direct the repairs in manner as before described; to certify same when done, and after the completion thereof, to put correct ground plans of the premises, with the external dimensions figured thereon, upon the leases and counterparts.

" To value the ground rent, and to prepare plans, elevations and sections, and particularize the manner of building upon such vacant ground belonging to the bridge house, as may be intended to be let to be built upon; to stake out the ground; to furnish the builder with all required drawings, and the scantlings of the timbers; to superintend and direct the carcase of the building in the same manner as hereinbefore described, and certify the same when done; and afterwards to put correct ground plans of the premises, with the external dimensions figured thereon, upon the leases and counterparts.

" To prepare and lay before the committee annually, an account of all lessees and tenants who have not performed their covenants; and when required, to prepare and lay before the committee an account of the dilapidations which the tenants of the said estates respectively, are liable to reinstate.

" To see that the several artificers and tradesmen send to the office of works weekly, their checks of day time, and materials; and that the said weekly checks do specify the names of the several workmen, and where employed; that the same be examined and signed, as to time and materials, by the tide carpenter of London bridge; to examine the bills thereof when delivered, see that the prices thereto are fair and reasonable, and certify the amounts thereof.

" To see that proper care is taken of all materials and stores belonging to the bridge house; and that the same are, as far as practicable, converted and used in repairs of the bridge house buildings and works; and to see that such materials as are not convertible to such uses, are sold and disposed of to the best advantage; to produce the bills thereof, and see that the amount of sales are paid into the bridge house.

" To prepare and lay before the committee every year, a report, stating such public buildings and works as are in progress of building or repairing, under the direction of the clerk of the works.

" To lay before the committee all such surveys and valuations of estates, property and premises, belonging to the bridge house; also all such designs, plans, descriptions and estimates for all new buildings; also all such plans, descriptions and estimates, for all repairs, alterations, additions or improvements to buildings heretofore erected; and also all estimates, bills, measurements and valuations relating thereto; and all other bills, plans, drawings, estimates and papers, relating to the buildings or works of the bridge house, as shall from time to time be called for."

### " *Assistant Clerk at the Bridge House:*

" To attend at the office in the bridge house daily, from the hours of ten to three, and prepare all receipts for rent and land-tax, to be signed by the bridge masters, and for monies paid by them, and to enter such receipts in the cash-book.

" To keep a ledger, in which an account is to be correctly kept with each of the lessees or assignees of the bridge house estates, of the several rents payable by and received from them; and a similar ledger for tenants at will; and also a ledger with the debtor and creditor account of the poor persons who have gained settlements on London bridge.

" To write, from time to time, to the several tenants whose rents shall be six months in arrear, for payment thereof; and to prepare and lay before the committee, at their next sitting after every Lady-day, a particular of the rents due from the several tenants of the bridge-house estates at Michaelmas preceding; and also to lay before the committee at their next sitting after every Michaelmas-day, a particular of the rents due from the said tenants at Lady-day preceding.

" To prepare and lay before the committee, at their first meeting in every month, a particular of all monies received and paid by the bridge masters on account of the bridge house during the preceding month, and of the balances in their hands, and in the chamber; such particular to be signed by the bridge masters and the assistant clerk.

"To keep an account of monies paid in, on account of the collector of rents of tenants at will in St. George's fields; to see that the payments bear a due proportion to the amount to be collected, as contained in the rental, and to report to the committee immediately, on sufficient grounds for apprehending neglect or defalcation in the collector.

"To examine the bills of artificers and others by the preceding bills, and see that no articles are twice charged; and to such examine such bills by the store-book and vouchers.

"To take necessary vouchers for, and keep an account of the coals, candles, and stationery delivered for the use of the bridge house; and to examine and certify all such bills, as to their correctness, previous to their being laid before the committee.

"To copy into a book all tradesmen's and other bills, for which warrants for payments are ordered by the committee.

"To extract from such bills, and enter in a separate book, all such portions thereof as are applicable to the works of London bridge.

"To examine the tide carpenter's weekly account of wages, to be paid to journeymen, labourers and others.

"To copy into a book kept for that purpose, a minute of all grants of leases made by the committee, all docquets of leases sealed, and all alienations made by the lessees of the bridge house estates.

"To mark, number, and keep a schedule, or index of all books, leases, counterparts, and other title deeds and documents, which are to be deposited in the muniment room at the bridge house.

"To attend all committees when summoned, and to attend the auditors appointed by the livery, when required.

"To prepare and make out an annual account of the produce and expenditure of the bridge house estates, for the court of common council, and a brief statement thereof for the committee.

"To prepare and make two fair copies, on vellum, of the bridge house accounts, for the auditors; one of which, after audit thereof, is to be deposited in the muniment room of the bridge house, and the other in the chamberlain's office.

"To assist the bridge masters on all occasions in the discharge of the duties of their office, and generally to execute all the orders of the committee."

"*Superintendent of the Works of London Bridge:*

"To superintend and direct the repairs of the bridge.

"To measure all the timber, stone, chalk, rubble, and other articles required for such repairs.

"To examine and certify, as to quantities and measurements, the several bills of artificers and others, relating to such repairs, previously to their examination as to prices, by the clerk of the works."

"*Bridge House Carpenter:*

"To execute such repairs of the starlings of London bridge as directed, by driving piles, fixing wale pieces, &c. &c. and generally all other works thereto in the carpenter's department.

"To keep an account of the men's time and tides, to make out an account weekly of the money each man is to receive as his wages for the bridge masters, and to superintend the payment of the men.

"To give notice at the office of works of the arrival of any timber, rubble, stone, or chalk, for the use of the bridge; to attend the measurement thereof, and afterwards to superintend the delivery thereof at the starlings, or on the bridge yard wharf, as may be directed.

"To line out and convert all timbers, &c. to the best advantage, and enter the same in a book, as to what purpose applied.

"To receive all stores of iron, lead, rope, &c. &c.; to examine the quality and quantity with the checks, and enter the same down in a book kept for that purpose.

"To sign the tradesmen's bills, as examined by checks, previous to their examination by the clerk of the works.

"To cause, when directed by the clerk of the works, boundary stones and marks to be placed upon such part of the bridge house estates, as may from time to time be necessary.

"To shore up and secure, when directed by the clerk of the works, all ruinous or dangerous buildings on the bridge house estates; to stake out with posts and rails any new streets or openings, or lots of ground for building leases, and to do the carpenter's work to such stairs on the river Thames, as are maintained and repaired by the bridge house.

"To attend the committee when required, and obey their instructions."

"*Bridge House Messenger:*

"To attend the bridge masters and the comptroller from time to time, and the chairman of the committee, when required; to receive directions relating to meetings of the committees; and to fill up, direct, and deliver summonses to attend such meetings, at the respective residences of the members thereof.

"To attend the committee at all meetings, and upon all views, with such books, plans, and papers, as shall be requisite, and to obey the orders of the committee.

"To provide such carriages for the committee, and to order such entertainments, on taking views, as the chairman shall direct.

"To summon, under the direction of the chairman thereof, and attend all meetings of the providetors from time to time, appointed for conducting the annual summer view of the

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the committee; to deliver summonses and invitations to the several members and others to attend the same; and generally to perform and obey all other directions and orders of such chairman, relating to the view.

"To summon, under the directions of the bridge masters, and attend all meetings of the auditors; to summon the proper officers to attend such meetings; and generally to follow the directions of the auditors, relating to such audit and examination.

"To deliver all letters, summonses and other papers, from the bridge masters, comptroller and assistant clerk, to the several tenants and lessees of the bridge house estates, relative to the payment of arrears of rent, and the performance of covenants and contracts, or otherwise relating to the bridge house concerns; and to deliver notices of meetings to such and all other persons having occasion to attend the committee.

"To deliver, under the direction of the comptroller, all advertisements relative to the bridge house estates, at the office of the respective newspapers in which the same are to be inserted.

"To deliver orders, from the bridge masters and assistant clerk, for coals and candles, and for such books of account, paper and other stationery and things, and to procure such stamps as shall be wanting for the bridge house.

"To keep the candles, to be provided for the watchmen in the bridge yard, in a box, under lock and key; and to deliver out, on every Saturday, a supply thereof, sufficient for the consumption of the ensuing week.

"To collect half yearly, for the audit of the committee, the bills of artificers and others, and to give notice to artificers and others (upon their respective bills being audited,) when they are to attend to receive payment.

"To light when necessary, and keep burning a fire, in the stove of the muniment room.

"To attend daily at the bridge yard, from ten the morning until three in the afternoon, unless otherwise engaged in the business of the bridge house, and generally to perform and obey the orders of the committee, the bridge masters, comptroller and assistant clerk."

*"Collector of Rents of Tenants at will in St. George's Fields:*

"To collect the rents from the several tenants; to keep a cash book and ledger account thereof, and to make out a general half-yearly statement of his receipts and payments, for the examination of the committee.

"To pay to the bridge masters weekly the monies received, reserving a balance in hand to defray parochial rates and other incidental expenses.

"To give information to persons applying to become tenants, and to attend with the keys to show any premises that may be empty, and to make inquiries as to character, &c. of persons desirous of becoming tenants.

"To notice any encroachments or nuisances that may be made on the estate, and to report the same to the comptroller and clerk of the works; and to prevent, as much as possible, any dilapidations, or other injuries being committed thereon."

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## Appendix, No. 10.

EXTRACTS from the Minutes of Evidence given before the Committee appointed to examine into the State of Newgate, and the other Prisons within the City of London and the Borough of Southwark; presented to the House on the 6th of May, 1818.

*Mr. Henry Woodthorpe*, jun. Called in; and Examined.

The inhabitants of the borough of Southwark had for a long time, by petition and otherwise, made frequent applications to the court of common council; and on the 23d of September, 1814, upon a petition from them, containing a variety of matter, and amongst other things, praying that the magistracy of the city of London in Southwark might be restored, it was referred to the committee for general purposes, to examine the allegations and to report; and on the 20th October following they made a report, in which they state, that in order to assist as much and as early as possible, in some of the objects and wishes of the said inhabitants, so far at least as might be in the power of the court, and might appear adviseable, they recommended that the court of lord mayor and aldermen, in whom the power of appointing a justice of the bridge yard is vested, should be requested at all times thereafter to appoint to that office an alderman who had served the office of lord mayor, (those aldermen only being legally competent to execute the office of a magistrate in the town and borough of Southwark, without the interference of some other power or authority,) and that the alderman so appointed should remain in his office of justice of the bridge yard, and so long as he should continue in his office of an alderman, and no longer; and that it was also highly desirable, that one other alderman, who should have served the office of lord mayor, should attend whenever necessary with the said justice of the bridge yard, to perform all acts in the said town and borough of Southwark, as are required by law to be administered and done by two magistrates; and the report being agreed to, was ordered to be laid before the court of aldermen; and Sir John Eamer was appointed to that situation, agreeably to the recommendation of that report.

On the 24th of November, 1814, the court of common council referred it to the committee for general purposes, "to consider and report, whether any and what sum of money out of the revenue arising from the estates in St. George's fields, and the borough of Southwark, shall be annually placed in the hands of the chamberlain, at the disposal of the court of lord mayor and aldermen, during the pleasure of the court of common council, to enable the said court

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court of lord mayor and aldermen to discharge the expenses of providing and establishing a proper and efficient magistracy, in and for the town and borough of Southwark, and also for the expenses of the compter or gaol in the said borough." A report from that committee was made to the common council on the 14th of April 1815, but which was confined to the establishment of an efficient magistracy, that had been so frequently petitioned for by the inhabitants of the borough, and the sum of 1,300*l.* was recommended, and ordered to be annually placed in the chamber for that special purpose, and to be apportioned as mentioned in that report, viz.—

"That an allowance should be made to the magistrate appointed by the court of lord mayor and aldermen to do constant duty in the borough of Southwark, of five hundred pounds, exclusive of one hundred pounds per annum allowed to the justice of the bridge yard, in lieu of his residence.

"That a clerk shall be appointed by the court of lord mayor and aldermen, with an annual allowance of three hundred and fifteen pounds.

"That two marshalmen should be appointed by the court of common council, with an annual allowance between them of one hundred and five pounds.

"That a housekeeper should be appointed by the committee for letting the bridge house estates, who should be the messenger, with an annual allowance of fifty pounds.

"That a sum of money should be allotted, amounting to about 230*l.* annually, to pay from time to time, as it may be required, the expenses of providing stationery, printing, coals, candles and other necessaries for the office, to be established in the said borough."

On the 27th of June 1815, the committee for general purposes, to whom it had previously been referred, to examine the petition of Mr. John Law, keeper of the borough compter, for an allowance in consequence of having been deprived of his situation in the court of requests, and not having received any salary from the bailiff, reported to the common council as follows: "That in addition to the present yearly sum of 1,300*l.* deposited in the chamberlain's hands, by the bridge masters, out of the revenues arising from the estates in St. George's fields, the further sum of 250*l.* should be in like manner deposited by them, the same to commence at Christmas 1814, to enable the court of lord mayor and aldermen to pay the salary and expenses of the keeper of the said compter; as from recent regulations that have taken place in the borough, it appeared to them requisite, that he should employ two assistants, who should be severally paid the sum of 50*l.* per annum, in full for their services, and that the remainder thereof should be paid to him, by way of salary for his services; that neither himself nor his assistants should be allowed for, take or receive any fees, or garnish money, upon any account or pretence whatever."

On the 27th of June 1816, the common council directed the bridge house committee to examine the state of the borough compter, and to report their opinion, what is most fitting to be done thereto, to render the same efficient for all its purposes. The foregoing order took place upon the motion of Mr. Alderman Wood, then lord mayor, which was made in consequence of the increased number of prisoners in that compter, arising from the exercise of the efficient magistracy in the borough. The bridge house committee not having made any report in pursuance of the before mentioned order, the attention of the court of aldermen was drawn to that compter, in January 1817, and a report from the committee of aldermen upon the subject was sent to the bridge house committee, who resolved, "That they were not empowered to enter into the consideration of the matter contained in the said report, without the previous sanction of the court of common council;" in consequence of which, the lord mayor, by decree of the court of aldermen, laid the same on the 23d January 1817, before the court of common council, as follows:—

"To the Right Honourable the Lord Mayor and Court of Aldermen.

"We, whose names are hereunto subjoined, of your committee, appointed to consider all matters relating to the gaols of this city, do certify, that amongst other things, we have taken a view of the borough compter, attended by Mr. John Holmes, the deputy bailiff of the borough, the clerk of this city's works, and Mr. William Hutchinson Box, the surgeon, and notwithstanding the present crowded state of the said compter, the same appeared to us to be in clean and decent order.

"That on our said view, being attended by the churchwardens, overseers and principal inhabitants of the parish of Saint Olave, Southwark, together with Mr. Thomas Edward Sherwood, their vestry clerk, who presented us a memorial, relative to the increase of disorderly persons in the said parish, the present crowded state of the borough compter, and the want of management and discipline therein; we inspected the plan produced by the clerk of the works of the scite of the said compter, and of the property adjoining, belonging to the bridge house estates, and took a view of the same; and we are of opinion, it is highly expedient and necessary to enlarge the borough compter; and finding that in letting the said property adjoining, a judicious reservation has been made by the committee of the bridge house estates, in order to afford further accommodation to the compter, if the same should be found necessary; we are of opinion that the committee for letting the bridge house estates, should as soon as possible possess themselves of the said reserved ground, to be added to the said compter, as circumstances may require, and will admit, and that a boundary wall should be forthwith erected, to inclose the whole: All which we submit to the judgment of this honourable court, this 16th day of October 1816.

"*Matthew Wood*, Mayor.
*James Shaw.*
*Samuel Goodbehere.*"

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The common council immediately referred the said report to the bridge house committee, who were also directed to confer with the aldermen. Conferences did take place, and on the 13th of June 1817, the committee not having made any report, Mr. Alderman Wood in his place, as lord mayor, again moved the court of common council, and the bridge house committee were directed to report forthwith on the reference to them of the 27th June 1816, relating to the borough compter, and the committee for general purposes were also directed to report relative to the expenses of the said compter,

On the 8th July following, the bridge house committee presented a report relating to the funds under their management, as not being in their opinion applicable to the purposes of the borough compter, the consideration of which report was adjourned, and the committee for general purposes presented their report on the 13th February last, with the report of the city solicitor upon the subject, stating, that the revenues arising from the estates in St. George's fields may be applied to that purpose.

[*Printed copies of the Reports were delivered in and read, as follows:*]

" To the Right Honourable the Lord Mayor, Aldermen and Commons of the City of London, in Common Council assembled.

" We, whose names are hereunto subscribed, your committee for letting the bridge house estates, do certify, that by an order of your honourable court of the 23d day of January last, it was referred to us to consider a report of the court of aldermen, appointed to consider all matters relating to the gaols of this city, for the enlargement of the borough compter, and to confer with the committee of aldermen thereon. We referred the same to a sub-committee, who have since made their report, hereto annexed; and we agreeing with the sub-committee in their said report, submit the same to the judgment of this honourable court.

Dated this 8th day of July 1817.

" *Wm. John Reeves.*
*Benjamin Bovill.*
*Wm. Rawlins.*
*Joseph Humpleby.*
*James Davies.*
*J. Daker.*
*John Ashlin.*
*Errington Paxton.*
*Stephen Hubberton.*
*Tho. Price.*
*Theop. Harvey.*
*John Pearson.*
*Robert Elliot.*
*W. S. Angell.*
*Jno. Elliott.*
*Matthew P. Lucas.*
*Thomas Conway.*"

" To the Worshipful Committee for letting the Bridge House Estates.

" Pursuant to your order of the 18th of February last, we have viewed the borough compter, and the ground and buildings adjoining thereto, and conferred with the committee of the court of aldermen, appointed to consider all matters relating to the gaols of this city, respecting their report for the enlargement of the borough compter; and being informed at such conference, that it was the opinion and intention of that court, that the ground proposed to be added to the seite of the compter, for the purpose of enlarging the same, together with the buildings thereon, should be given up or granted to the city, without any rent or other consideration being paid for the same; and that the expense of inclosing the whole ground with a boundary wall, of enlarging the present compter, and of erecting any other buildings on the said ground, should be paid and discharged out of the bridge house estates; we considered the subject deserving of our most serious attention and investigation, inasmuch as any hasty and premature resolution, in compliance with the wishes of the court of aldermen (however expedient and laudable their ultimate views and purposes may, and are considered by us to be), would establish a principle which, if once admitted by your worshipful committee, might in progress of time be attended with very great expense and important consequences, and be not only injurious to the bridge house estates, but to the credit and dignity of the corporation. Under this impression, we considered it necessary to inquire into the tenure and constitution of the bridge house estates, and to consider the several charters by which the jurisdiction of the city over the borough of Southwark was granted, and various proceedings of the court of common council, and of this worshipful committee, in relation thereto.

" We find, upon inspection of a book of antient grants, the rentals of the bridge house and the bridge master's accounts, that all the lands (and amongst others the site of the borough compter and the ground proposed to be added thereto) which were denominated Bridge House Estates, previously to the year 1550 (when the lands in St. George's fields were purchased,) were granted or devised to, or otherwise became vested in the city expressly upon trust, for the support, maintenance and repair of London bridge, or had been purchased out of the rents and profits of those estates, of the produce of established tolls and customs, created for the exigencies of the bridge, and of contributions by briefs, voluntary alms, benefactions and legacies, given and bequeathed for the same purpose; and we find, that the city of London first obtained jurisdiction in the borough of Southwark by charter from Edward 3, A.D. 1327, which was granted (as therein stated) upon the petition of the citizens of London, alledging that felons, thieves, &c. who in the city had committed offences, privily departed therefrom into Southwark, where they could not be attached by the ministers of the city.

" This jurisdiction was confirmed by the charter of Edward 4, A.D. 1462, which was granted (as therein is stated) for the purpose of taking away and utterly abolishing all doubts,

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doubts, controversies and dissentions, respecting the use and exercise of the liberties and franchises intended to be granted to the city. In this charter those rights liberties and franchises are particularly defined, which was not done in the preceding charter. No pecuniary consideration appears to have been given for either of these charters.

"The jurisdiction granted by kings Edward 3 and 4, was enlarged and made more efficient by the charter of 4th Edward 6, A. D. 1551, and upon this charter the subject in discussion principally turns. It contains two grants. By the first, the king in consideration of six hundred and forty-seven pounds two shillings and one penny, paid by the mayor and commonalty and citizens of the city of London (which was paid out of the bridge house funds,) gave and granted to them,—'several messuages or tenements and closes of ground, in Newington, Saint George's fields, and Lambeth, therein particularly described; together with the lordship and manor of Southwark, with the messuages, rights, members, and appurtenances thereto belonging, and several yearly quit rents, &c.'

"By the second grant in this charter, the king, in consideration of five hundred marks, or three hundred and thirty-three pounds six shillings and eight-pence, paid by the said mayor and commonalty and citizens (which sum was also paid out of the bridge house funds,) granted to the city the same jurisdiction in Southwark, as they had previously exercised under the charters of Edward 3 and 4; together with several additional franchises, privileges and advantages, reserving to the Crown an antient farm rent of ten pounds per annum, which had also been reserved in the former charters, and which has been always paid out of the city's cash.

"Having thus endeavoured to state fairly and concisely the tenure and constitution of the bridge house estates, and the several charters by which the city's jurisdiction in the borough of Southwark was obtained, we consider it proper to state the grounds which appear to favour the city's right to apply the rents and profits of the bridge house lands, in St. George's fields, for the purposes mentioned in the report of the committee of aldermen, together with our observations thereon.

"It may be advocated in support of that right;—

"Firstly.—That the several sums of money given for that charter, are therein expressly stated to have been paid by the mayor and commonalty and citizens of the city of London.

"Secondly.—That the charter does not state, that the lands in St. George's fields are granted to the city in trust, for the maintenance and support of London bridge; and—

"Thirdly.—That as certain duties and estates are granted to the city by the same charter, the revenue arising from the estates should specifically defray the expenses incurred in executing the duties.

"In answer to which, and with reference to the first position—That the monies given for the charter are therein expressly stated to have been paid by the mayor and commonalty and citizens; we find, upon examination of the bridge masters accounts, and the rentals of the bridge house estates, that such sums of money, amounting together to 980 *l.* 8 *s.* 9 *d.* were paid by the bridge masters out of the bridge house funds; that the rents of the lands conveyed by the charter, then amounting to 26 *l.* 16 *s.* 1 ¼ *d.* per annum, were first entered in the bridge masters accounts, in the year 1554, and that the bridge masters have from that distant period to the present time, (a space of more than 250 years,) been in the uninterrupted receipt thereof.

"And we find, upon inspecting various proceedings of the court of common council, and of your committee, that these lands, and the rents and profits thereof, have been always considered and applied by the court as parcel of the bridge house estates, in the same manner as the more antient estates devised to, or otherwise vested in the city upon trust, to maintain and support London bridge, and the rents and profits thereof, have been from time to time applied and appropriated.

"With reference to the second position, that the charter does not state, that the lands in St. George's fields are granted to the city in trust, for the maintenance and support of London bridge; we find that other lands purchased out of the bridge house funds, have, in like manner, been conveyed to the city absolutely, without stating the trust, but the same were afterwards invariably inserted in the rental of the bridge house estates, and the rents and profits thereof received by the bridge masters; and we also find, that the rents reserved in all cases (antient and modern,) of the bridge house estates, are made payable to the city, in the same general and unconditional manner. In addition to which, the lands in St. George's fields have never hitherto been charged with the orphans duty, to which all other estates vested in the city, except the bridge house and royal hospital estates, are liable.

"With reference to the third position, that certain duties and estates, being granted to the city by the same charter, the estates should specifically defray the expenses incurred in the execution of the duties; we observe, that it being evident from the dates of the several charters, that the jurisdiction in Southwark was enjoyed by the city, more than 220 years before the charter, now under consideration was granted, it appears to us, that no new duties were imposed on the city by that charter, but on the contrary, we think it may fairly be presumed, that as a pecuniary consideration was given for such enlarged jurisdiction, additional magisterial powers and privileges only were thereby granted, and that the duties (if solicited privileges and franchises can with propriety be denominated duties) were imposed by the former charters. And it is also to be observed, that although the grant of the lands, and the grant of the additional privileges, were both contained in the same charter,

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yet they are separate and distinct grants, made for separate and distinct pecuniary considerations, and that the lands comprized in the one grant, are not in any manner incumbered or fettered with any charges or conditions whatever, in regard to the powers and privileges comprized in the other grants.

" Before we conclude our observations on the construction, intention, and purposes of the last charter, we must observe, that having found (as before stated) that all the antient bridge house estates were devised and granted to the city, expressly upon trust for the support of London bridge, and that the original jurisdiction of the city in Southwark, granted by the charter of Edward 3, was not obtained for the protection or benefit of the inhabitants of Southwark, but of the lives and properties of the citizens of London (by protecting them, as therein stated, against felons and thieves, who took refuge in Southwark), we have not yet been able to discover the principle upon which the money paid for the purchase of the powers and privileges granted by the charter of Edward 6, was paid out of the bridge house funds, because those powers and privileges could only be exercised and enjoyed by the city and its officers, and could not, as we conceive, be in any manner beneficial to the lands in St. George's fields, granted by the same charter, which were at that time of the very trifling value of about 25 *l.* per annum.

" In addition to the facts above mentioned, we also find a reference to the proceedings of the court of common council, and of your committee, that on the 27th July 1717, a lease was granted by the city to Robert Marshal, of the late compter prison, by him erected on ground in the parish of St. Olave's, Southwark (parcel of the bridge house estates), for sixty-one years, at the clear yearly rent of twenty shillings; and that, on the 30th day of June 1757, certain fees and perquisites, theretofore taken by the bailiff of Southwark, were abolished by the court of common council; and as a full compensation to the bailiff, it was resolved by the court, that the covenants on his part, for the payment of the rent, and for the repairing and keeping the prison in repair, should not in future be inserted in the leases.

" That the prison having been destroyed by fire in the year 1780, a new prison was erected at the city's expense, upon the site of the old prison, and upon other ground adjoining, belonging to the bridge house.

" That in pursuance of an order of the court of common council, of the 30th of November 1790, a grant was made by your committee to Mr. Chamberlain, of the compter prison, for ninety-nine years, from Lady-day then last, at the clear yearly rent of two pounds, payable by the chamberlain to the bridge masters, and upon condition of his keeping the premises in sufficient and necessary repair, and leaving the same in such repair at the end of the term, which reserved rent has been regularly paid by Mr. Chamberlain to the bridge masters.

" We also find, that on the 6th day of October 1803, the committee for general purposes reported to the court of common council their opinion, that certain expenses, amounting to 11,876 *l.* 19 *s.* 7½ *d.* which had been incurred by the city during the preceding twenty years, in respect of the borough of Southwark (including 2,593 *l.* 8 *s.* 2 *d.* on account of rebuilding of the compter), should be repaid by the bridge house, and that such report, after having been agreed to by the court, was printed, together with a report of your worshipful committee on the same subject, and a copy thereof sent to every member of that court, and was finally negatived by the court on the 27th day of March 1806.

" It appears to us, from the above mentioned and other proceedings of the court of common council, that all expenses of maintaining the city's jurisdiction in the borough of Southwark, of building and repairing the borough compter, and of supporting the prisoners confined therein, have been paid out of the city's, and not the bridge house funds, until a recent period, when, by an order of the court of common council of the 14th of April 1815, 1,300 *l.* per annum (after deducting certain fees) were directed to be, and have since been placed by the bridge masters into the hands of Mr. Chamberlain, for the purpose of paying the expense of establishing an efficient magistracy in Southwark. We consider it, however, proper to add, that we find, upon reference to the bridge master's accounts, that in the year 1661 (more than 100 years after the charter of Edward 6 was obtained,) they first paid twenty pounds for one year's fee (not salary) to the justice of Southwark, under the denomination of an antient and accustomed fee, which payment was continued until the appointment of Sir John Eamer to that office. There are other trifling payments of a similar nature; but which ought, in our opinion, to be regarded rather as irregular deviations from the general rule, than as any justification of the principle now sought to be established.

" Having taken into our best and most deliberate consideration, the several facts and circumstances above submitted to your judgment; and, at the same time, being desirous to afford every proper assistance and accommodation in our power to the court of aldermen, in the exercise of the city's jurisdiction in the borough of Southwark, we are of opinion, that as soon as possession thereof can be obtained by your worshipful committee, the ground adjoining to the borough compter, and described in the plan produced, with the buildings thereon, should be granted to Mr. Chamberlain for a term of years, to expire with the grant of the compter, at such rent payable to the bridge masters, and upon such conditions as shall hereafter be agreed upon.

" And we are also of opinion, that under the circumstances above mentioned, the expense of erecting a boundary wall to inclose the compter and the ground proposed to be added thereto, of enlarging the compter, of erecting any other buildings, and all other

charges

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charges to be hereafter incurred in respect of that prison, ought not to be paid out of the rents and revenues of the bridge-house estates: All which we submit to the consideration of your worshipful committee. Dated this 8th day of July 1817.

" *Robert Elliott.*
*Joseph Humpleby.*
*J. Daker.*
*John Ashlin.*
*Thomas Conway.*
*John Pearson.*
*John Elliott.*
*Benjamin Bovill.*
*James Davies.*
*William Rawlins.*
*William John Reeves.*
*Thomas Price.*
*Theophilus Hearsay.*
*Errington Paxton.*
*W. S. Angell.*
*Stephen Habberton.*
*Matthias P. Lucas.*"

" To the Right Honourable the Lord Mayor, Aldermen and Commons, of the City of London, in Common Council assembled.

" We, whose names are hereunto subscribed, your committee for general purposes, to whom, on the 13th day of June last, it was referred to report on the reference from this court, of the 24th day of November 1814, relative to the expenses of the compter or gaol in the borough of Southwark, being defrayed out of the revenues arising from the estates in St. George's fields and the said borough, do certify, That we have proceeded in the consideration thereof, and having directed Mr. Solicitor to consider and report his opinion on the power of this court, to appropriate the monies arising from those estates for such purposes, he has since made a report to us in writing, under his hand thereon, which we have caused to be hereunto annexed: All which we submit to the judgment of this honourable court. Dated this 13th day of February 1818.

" *C. W. Hick.*
*W. Matthews.*
*W. Waterhouse.*
*Edw. Frisby.*
*W. Cawthorn.*
*Thomas Harper.*
*Thomas Parker.*
*J. Hurcombe.*
*John Jackson.*
*Edw. Hughes.*
*John Adcock.*
*James Pearsall.*"

" To the Worshipful the Committee for General Purposes.

" Gentlemen,—Pursuant to your order, whereby I was directed to report upon the reference from this worshipful committee, respecting the monies arising from the estates in St. George's fields, being applicable to the expenses of the borough compter, I have the honour to certify, that I have perused and considered the several charters in relation to the rights, liberties, and jurisdiction thereby granted to the mayor, and commonalty and citizens of London, and have also examined several records and documents at the bridge house relative thereto; from which it appears, that previous to the granting of the charter of Edward the Sixth, the mayor, and commonalty and citizens, held the said town and borough in fee-farm of the Crown, and their jurisdiction consisted in the power to arrest felons, the assize of bread, the office of clerk of the market, the execution and return of writs, &c. and that the corporation were entitled to the revenue arising from fines, forfeitures and amerciaments, waifs, estrays, treasure trove, &c. &c. granted by the charter of Edward the Fourth, and by which they were enabled to pay their fee-farm rent: that in those grants which were antecedent to the charter of Edward the Sixth, the rights, franchises and liberties of the archbishop of Canterbury, the prior and monks of Bermondsey, and of other lords of liberties in Southwark, were excepted; that by the city's purchase of the charter of Edward the Sixth, all the rights, franchises and liberties, which belonged to those lords, and were held with their lands, were transferred, together with those lands, to the city, and granted in as full manner as the former lords ever held or enjoyed the same; and the city jurisdiction and franchises in Southwark became thereby greatly enlarged and extended.

" That among the temporal rights of the archbishop of Canterbury, was the office of bailiwick of Southwark, of which the city became possessed by this purchase, and which had been in former times granted by the kings to individuals, when there happened to be a vacancy in the see during the period of such vacancy; that the prior and monks of Bermondsey had the franchise of royal and criminal jurisdiction, infangtheft, summons and inquest, with other liberties and customs, which belonged to the Crown, and had a gaol and a gaol delivery within their district, as many of the religious houses antiently claimed to have the charges of exercising; which jurisdiction, and of maintaining the gaol, must consequently have been a charge upon the revenues arising from the lands, and which the city so purchased; that to enable the mayor, and commonalty and citizens, however, to exercise criminal jurisdiction, and for that purpose to hold sessions of the peace, and to deliver the gaol, it became necessary to invest their magistrates with powers as justices of the peace in Southwark. The charges of maintaining the criminal jurisdiction by the city magistrates, in their character of such justices of the peace, and of supporting the gaol, of which the city's bailiff of Southwark is the keeper, seems therefore, as I humbly submit, to be properly chargeable upon the revenues arising from the manors and lands in question. I beg leave further to observe, that in the course of my examination of the records and documents at the bridge house, it appeared that in the antient bridge master's accounts, the rents arising from the lands in question were distinguished from the rents of lands proper, and also of foreign

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lands, belonging to and applicable solely to the sustentation of London bridge, and the lands, granted by the charter of Edward the Sixth, which are denominated "new purchased lands." I beg further to observe, that in the proceedings relative to the purchase of those lands, great care appears to have been taken to assert the city's right to the use of them. In the first instance, the common serjeant was directed to draw a book for the city to the king's highness, for the purchase of his highness's lands and liberties in Southwark, to the city's use; the sum of money paid to the king is not said to be borrowed from the bridge house, but to be taken from the bridge house, and therefore probably might have been the accumulation of the city's profits under the charter of Edward the Fourth, or of other lands given to the city for other purposes than the support of the bridge; and which, from their locality, might have been placed in the receipt and account of the bridge house, and not from the proper rents or revenues incidental to the bridge, but being money in the bridge master's hands, from whatever source derived, other than those devoted to the sustentation of the bridge, and belonging to the city, the common council directed the sum wanting to be taken from the bridge house, and a few days afterwards ordered that the bridge masters should be discharged upon their account for the money so taken. That care appears also to have been taken by the corporation to record the fact, when estates were purchased to the use of the bridge, as in the year 1563, of the purchase of lands of Elizabeth Agar, to be conveyed to the chamberlain, expressly for the use of London bridge. It further appears, that two days after the date of the charter of Edward the Sixth, it was declared, that what should be received by the bailiffs for waifs, estrays, &c. should be paid to the bridge masters, for the use of the city, to whom it is there expressly said to belong; and in the bridge master's accounts of 1553 and 1554, credit is given by them for perquisites and profits received by the bailiffs for the city's use. In 1556, the sum of *6l. 7s. 8d.* is charged in the bridge master's accounts, as paid for rogues and vagabonds, persons taken and kept in the compter, by order of the lord mayor and aldermen. Several other items in those accounts, also show, that charges occurred in the exercise of criminal jurisdiction by the city magistrates, as justices in Southwark, have been defrayed out of monies in the hands of the bridge masters. It appears further, that the corporation have distinguished between the proper lands devised or given for the sustentation of the bridge, and the new purchased lands, in the instance where the corporation took a lease of the ground, whereon the borough compter is now erected, from the bridge house, that ground being in fact part of the antient and proper lands for the support of the bridge. In the most antient leases also, of the lands pertaining to the bridge, the same were demised by the bridge masters, by virtue of their office, and the rents reserved to them, and the leases executed under their seal of office: All which is submitted to the consideration of this worshipful committee, by

" gentlemen, you faithful and obedient servant,

" Guildhall, February 9, 1818. " *W. L. Newman*, Solicitor."

" The lands contained in the charter of Edward the Sixth, are several messuages or tenements in Southwark, Molter's close, containing fifteen acres in Newington, two acres, being St. George's fields dunghill, a close of land in Lambeth marsh, thirty-nine acres and three roods of meadow, lying in several parcels in St. George's fields, several other messuages in Southwark, which were formerly the lands of the duke of Suffolk.

" The lordship and manor of Southwark, which belonged to the monastery of Bermondsey, and all messuages, lands, tenements, meadows, pasture, common wastes, streets, roads, grounds, rents, &c. which belonged to the said monastery; the manor and borough of Southwark, with all their rights, members and effects, late parcels of the possessions of the archbishop of Canterbury, and the annual rents and services issuing out of messuages in Southwark and Newington; and all other messuages, lands, tenements, rents, reversions, services and hereditaments, which belonged to the archbishop and bishoprick of Canterbury.

" On the 18th of February last, the bailiff of the borough of Southwark having previously presented a report to a committee of aldermen, in relation to the present state of the borough compter, the lord mayor, by desire of the court of aldermen, laid the same before the court of common council, requesting that they would take it into their most serious and immediate consideration, whereupon that court resolved:—

" That the proceedings of the court of aldermen, and the report of the bailiff of the borough of Southwark, be referred to the committee for letting the bridge house estates; and that the said committee do prepare an estimate of the increasing charge of putting the borough compter into such a condition as may be proper for the accommodation of the prisoners confined therein; and that the funds arising from the several estates mentioned by the city solicitor in his report, annexed to the report of the committee for general purposes, read in the last court, as in his opinion liable to the purposes of justice, be applied to the same."

## Appendix, No. 11.

Appendix, N° 11.

COPY, QUERIES and OPINIONS of Counsel, on the liability of the Bridge House Estates, in Saint George Fields, to defray the Expenses of maintaining the City's Criminal Jurisdiction in Southwark, and of supporting the Borough Compter.

1st. Whether the lands and hereditaments in question are or are not specifically chargeable with the expense of supporting the prison, and maintaining the city's criminal jurisdiction in Southwark.

2d. Whether, in case the said lands and hereditaments are not specifically charged with, or otherwise liable to such expenses, the same lands and hereditaments are not vested in the corporation, as part of the city's proper estates, and the rents and profits thereof, applicable by them in or towards payment of the said expenses, or whether they are not held in trust for the support and maintenance of London bridge.

### MR. RECORDER'S OPINION.

I have read with care and attention, the statement of the facts, as well as the arguments, and several reports and observations made thereon; upon the whole of which, I have not been able to trace any evidence, by which I can be warranted to draw the conclusion, that the lands in question were either *ratione tenuræ* or otherwise, under an obligation to repair or sustain any public jail, or to defray the expense of any criminal jurisdiction.

The jurisdiction of the city magistrates, who have passed the chair, is concurrent within the borough, with the magistrates of the county of Surrey, while acting within the borough, and the sessions were formerly held for the county of Surrey, and also for the borough of Southwark in the same place, (that is to say) in the town hall, and the prisoners there tried, were indiscriminately committed to the county jail, which was then locally situated within both jurisdictions, but which has since been removed to Horsemonger-lane, which is now out of the jurisdiction of the borough, notwithstanding which, it does not appear, that at any time, any claim has been made by the county magistrates upon the bridge house estates, for any contribution towards the support and maintenance of that jail, over which the magistrates of the borough of Southwark had a partial jurisdiction. Taking the whole, therefore, into my most serious consideration, I am of opinion, that the rents and profits of the several lands granted by the charter of Edward the 6th, are held in trust for the support and maintenance of London bridge, and not specifically or otherwise chargeable with the expense of supporting the prison, and maintaining the city's criminal jurisdiction.

In regard to the second question, it seems to me that the lands are and must be deemed to be the legal estate of the corporation, because in them and in them alone, can they be vested.

The bridge masters are merely officers, nominated and appointed for the management and care of the estates and revenue, which are destined for the maintenance and support of London bridge, and therefore the bridge masters must account to the corporation.

The estates cannot be vested in the bridge masters, they not being a corporation, but annual officers appointed for particular purposes.

It likewise appears, that when these estates were originally purchased from the crown by the corporation, the consideration money was taken from the bridge house estates, that is, from that fund which was part of the produce of those estates, from whence I draw this conclusion, that the rents and profits are held by the corporation in trust, for the maintenance and support of London bridge, and ought not to be applied to the general uses of the corporation, but for the support and maintenance of London bridge.

*John Silvester.*

25th September 1819, Bloomsbury Square.

### MR. COMMON SERJEANT'S OPINION.

The mayor, commonalty and citizens of the city of London, have been from time to time, beyond legal memory, the keepers and proprietors of London bridge, and from very early times have received bequests and gifts of lands for the support of the said bridge; they are, therefore, liable both by prescription and *ratione tenuræ*, to the support and repairs of the said bridge, to the extent of the value of *all* their lands, as well those held to the *express use* of the bridge, as those not so held. With respect to those *lands* conveyed to them by the charter of Edward the 6th, the mayor, commonalty and citizens are not *bare naked trustees*, but they are *seised of the fee*, and though the rents and profits of those lands are applicable to the same trusts with the rents and profits of the estates, given specifically in trust for the use of the bridge, yet that trust being provided for, *every ulterior profit* arising from those lands, is to their own own proper use and benefit, and applicable to any purpose they may elect. Whatever monies have arisen and accumulated from the *hereditaments* granted by the charter of Edward 4th, though confirmed by the charter of Edward 6th, and though kept in the accounts of the bridge house, and mixed up in the same mass, and from time to time accumulating with them, are unquestionably the property of the mayor, commonalty and citizens, *unfettered* by any trust for the use of the bridge; those hereditaments are waifs, estrays, goods and chattels of traitors and other felons, and all escheats and forfeitures, together with the profits of the fair, and returns of writs, and whatever was derived from the sale of offices, in the town and borough of Southwark, whilst that practice prevailed.

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These must have formed a considerable sum, accumulating from time to time with the funds expressly appropriated to the bridge; for I find, in the year 1648, four houses in the High-street of the borough, escheated to the city. The corporation have, from the earliest times, subsequent to the charter of Edward 6th, acted upon the principle of their having *an ulterior beneficial interest* in the charter lands, beyond the *bare trust*, for the bridge. They have, by act of common council (as appears by the bridge house accounts,) appropriated 100*l.* to the support of the city's splendor, in the annual Guildhall entertainment. In the year 1595, 75*l.* for furnishing the provost marshall with his horses; in the year 1601, 80*l.* to Mr. Read, the marshall, for his services done to the city; in the same year, 5*l.* as a present to the judges, when they held the assizes for the county of Surrey, in the borough of Southwark. Viewing the case therefore in all its bearings, though I am of opinion that the rents and profits of the lands granted by the charter of Edward 6th, are held in trust for the support and maintenance of London bridge, and are not *necessarily* chargeable with the expense of supporting the prison, and maintaining the city's criminal jurisdiction in Southwark; yet I am of opinion, that the appropriation of a part of the rents and profits of those lands, for a purpose so connected with, and resulting from the charter (if to an extent not endangering the trust,) is fully warranted in law. Whatever funds have arisen and accumulated (though mixed and blended in the bridge house accounts,) or may hereafter arise and accumulate out of the *hereditaments* above mentioned, I am decidedly of opinion, may be legally applied to the support of the prison, and the criminal jurisdiction of the mayor, commonalty and citizens of the city of London, in the borough of Southwark.

*Newman Knowlys.*

Lincoln's Inn Fields, June 9th, 1819.

## MR. BOLLAND'S OPINION.

1st. Although from the lapse of time some difficulties present themselves in this case, the documents which exist, and the labour and research which have been applied in the investigation of them, appear to me to put the matter in as intelligible a point of view as any question involved in such remote antiquity can ever be expected to be placed; the two grants in the charter of Edward VI, of the lands and the jurisdiction, are perfectly distinct and independent of each other. The first gives to the mayor, commonalty and citizens, several messuages tenements and lands situate in Southwark, Newington, and Lambeth, together with the lordship manor and borough of Southwark. The second gives to them a jurisdiction through the borough of Southwark, and various privileges and rights within the same; but the grant of the lands is in no way whatever charged with the expense of maintaining the jurisdiction, nor is the jurisdiction which is granted very materially different from that which was originally given to them (though in more general terms), by the charter of the 1st Edward III, and afterwards more particularly granted and pointed out by the charter of the 2d Edward IV. No gaol, nor the charge of keeping up and maintaining any prison, is mentioned in the charter which grants the lands, nor does it appear from the case, nor can I by my researches find, that any gaol existed in Southwark, in the time of Edward VI, except the King's Bench and the Marshalsea, which certainly were in being before the year 1441, as appears by the statute of the 19th Henry VI, c. 10. It is material, too, to remark, that the charter of Edward IV, and the charter of Edward VI, give to the mayor, commonalty and citizens, and their minister or deputy, a power of taking and arresting all manner of felons, thieves, and other malefactors found in Southwark, and of leading them to the King's gaol of Newgate; and that this power is granted in the same form of words in both charters, excepting that in the charter of Edward III, the words are, "found in the said town," and in that of Edward VI, "found within the borough town, parishes and precincts aforesaid."

As therefore it is clear that the city of London had a jurisdiction in Southwark, from the year 1327, the expenses of exercising which it was bound to provide for, and did provide for, and maintained the borough prison, if any prison for felons existed; and as the charter of Edward VI. granting the lands in question, does not charge those lands with the support of that jurisdiction, nor with the maintenance of any prison; and as the city is stated to have always paid out of the chamber the antient and accustomed fee farm rent of 10*l.* per annum reserved to the crown by each of the charters; and as the city, independently of other acts from which its liability to support the borough counter might have been inferred, placed that liability beyond all doubt, by rebuilding the compter at the city's expense, after its destruction in 1780; I am of opinion, that the lands and hereditaments in question are not chargeable with the expense of supporting the prison, and maintaining the city's criminal jurisdiction in Southwark.

2dly. The extracts from Rep. 12. Amcott's, fo. 72, 9th April 1549, and fo. 219, 29th March 1550, confirmed and explained by the entry in the accounts of the bridge masters, in 1550, and that in Rep. 12, Hill, fo. 225, 29th April 1550, clearly show, that the whole consideration to the Crown for the two grants in the charter of Edward VI, was paid out of the funds of the bridge house; and the receipts of the rents by the bridge house of the lands granted; the various leases made of them, and the uniform appropriation of those rents to the purposes of the bridge, with the full knowledge and approbation of the city, as clearly prove that the purchase was made for the benefit and use of the bridge house; it was by no means necessary, that any trust should be specifically declared in the grant. If the funds which purchased the lands belonged to the bridge house, the rents and profits of the lands would by law become applicable to the same purposes, as those to which the trust money originally was liable. For these reasons, I am of opinion, that the lands and hereditaments are not vested in the corporation as part of the city's proper estates, but are held in trust by them, for the support and maintenance of London bridge.

May 19th, 1819. *William Bolland.*

## MR. SERJEANT LENS' OPINION.

I have perused the whole of this very full statement of the arguments, as well as the facts of this case, and also the several reports and observations which accompany it, and have not been able to discover any trace of evidence, from which it can be concluded that the lands in question ever were subject by tenure, or in any other manner to the obligation of repairing or sustaining any public jail, or defraying the expenses of any criminal jurisdiction. As all public jails belong to the King, and cannot be erected by any subject, such a tenure can hardly be expected to exist; but where the lands have been originally granted by the crown, subject to such a condition, and upon their reverting to the crown, by escheat or otherwise, that particular tenure or obligation would, as I conceive, cease to exist, and become extinguished. In this particular case, the lands appear to have been in the hands of the crown so late as the time of Edward VI. His charter and grant, by which they passed to the corporation of the city of London is extant, and no such condition appears in it, nor have I been able to trace any proof as to the existence of any jail at that time, or the period of its commencement. The criminal jurisdiction which has existed in the city, as to the vill, or borough of Southwark, is probably not to be considered as derived merely from this charter, but is of earlier date; and that jurisdiction is not exclusive, but is concurrent with the justices of the county of Surrey as has been judicially decided. Whatever obligation may now belong to the corporation to uphold this jail, which the public interest may require, and long usage may have fixed upon the corporation, I see no ground for connecting it with these or any other particular lands, either by tenure or any other legal authority, and it is still more difficult to attach to any lands, the more indefinite and vague obligation of defraying the expense of "maintaining the *criminal jurisdiction,*" in any particular district.

On the 2d question here proposed, my opinion is, that these lands must be deemed to be vested in the corporation of the city, and not in the bridge masters, who appear to be no corporation, or even guild in themselves, but merely officers appointed for the management and care of the estates and revenues destined for the maintenance of London bridge, liable to the audit and account of the corporation, in whom the legal estate in the lands is vested; but I think the corporation hold all the bridge estates, as trustees, to that purpose, and cannot at their discretion, apply the produce of such estates to other purposes, or to the general uses of the corporation to which the city lands are destined, and that whenever the corporation has so applied them, by orders addressed to the bridge masters, or the bridge committee, it has been a misapplication of the funds; and though such orders have been obeyed, and perhaps could not be disputed by the officers nominated or elected by the corporation, or any part of it, that will not alter the right or enlarge the power of application. It appears from the statement here made, that these lands were originally purchased from the crown, by the corporation; but the consideration money so paid was taken from the bridge estate fund, being part of the produce of their estates, and has never been returned to that fund as a debt due on an advance made to the corporation, and the rents and profits have ever since been regularly kept distinct, and accounted for as part of the receipts for which the bridge masters, as such, were accountable, as being the issues of the estate which they had in charge. I think this would be deemed satisfactory proof in the court of chancery, of the existence of the particular trust, and the corporation be denominated trustees, and confined in the application of the receipts, to the particular objects of this trust, as distinguished from the general funds belonging to the corporation at large.

Lincoln's Inn, April 27th, 1819. *John Lens.*

## MR. SCARLETT'S OPINION.

I have perused this case, and the accompanying papers, with great attention; and it appears to me, that the lands and hereditaments in question, are not specifically chargeable with the expense of supporting the prison, and of maintaining the criminal jurisdiction of the Corporation of London in Southwark. There is no evidence that these lands and hereditaments ever were specifically chargeable for any purposes of supporting a prison, or any criminal jurisdiction, before they became vested in the corporation of London. It does not appear that they were granted to the corporation for any such purposes expressed or to be implied from the charter of Edward VI; and it is very clear, that they have never since that period, until this question arose, been applied to any such purposes.

2d. From the circumstances attending the original purchase of these lands, and as they appear in this case, and from the long usage of applying the rents and profits to the general purposes of the bridge house estates, I am of opinion, that they are held by the corporation of London, not as part of their property applicable to general purposes, but as trustees for the maintenance of London bridge. Indeed, I consider the body of evidence so strong and clear upon this point, that I think no jury to whom it could be submitted would entertain a doubt about it.

Temple, May 10th, 1819. *J. Scarlett.*

Appendix,
N° 12.

## (Appendix, No. 12.)

COPY PETITION presented to the Court of Common Council, in or about the year 1814, praying for the Establishment of a Magisterial Jurisdiction in Southwark.

" To the Right honourable the Lord Mayor, and Commonalty and Citizens of the City of London, in Common Council assembled.

" The Memorial and Petition of the Inhabitants of the ancient Town and Borough of Southwark,

" Sheweth,

" That King Edward the Sixth, in the 4th year of his reign, (the antient town and borough of Southwark being then wholly in his hands,) by charter, or letters patent, under the great seal of England, granted the said antient town and borough, and the rights and royalties thereof, to the mayor commonalty and citizens of the city of London; and thereby all persons inhabiting or resident within the said borough, were to be in the government of the mayor and officers of the city of London, and their deputies, for the time being, as the citizens and inhabitants of the said city were and ought to be; and the said mayor commonalty and citizens, and their successors, should from thenceforth have, enjoy, and use the same laws, jurisdictions, liberties, franchises and privileges in the said borough, as fully as they then used, or ought to have used and enjoyed in London, by virtue of any charters theretofore granted by any of the King's progenitors to the said mayor commonalty and citizens: That the borough of Southwark is an antient corporation, and by the said charter, the mayor of London, and the recorder of London, for the time being, and such of the aldermen as have borne the charge of mayor, are constituted charter justices for the said borough; and the said mayor recorder and aldermen, have ever since, and do now hold, sessions of the peace at the town-hall of the said borough: That to the said borough belongs an antient court of records for all debts above forty shillings, damages and trespasses, which ought to be holden every Monday at the town hall of the said borough, before the recorder of London, or his deputy, and a jury of the inhabitants of Southwark, wherein justice may be obtained more speedily and at less expense than at the superior courts at Westminster: That by reason of the neglect of the rights and privileges belonging to the antient town and borough of Southwark, conferred by the said charter, distinct and separate from the county of Surrey, but more especially by there being no resident magistrate in the borough, to support the jurisdiction of the city of London therein, all persons bringing offenders to justice for crimes committed within the said borough, are bound by recognizance to prosecute at the sessions for the county, or at the assizes, and the borough sessions, have thereby become the shadow only of a court of justice, and the time of attendance of inhabitants of the borough liable to serve as jurymen, and of the constables and other officers, at the county sessions, have been within a few years last past more than doubled, and the court of record, heretofore held at the town-hall, has, to the great inconvenience of the inhabitants, become almost forgotten: That although the charter of King Edward the Sixth appears to have intended, that the government of the borough of Southwark should be vested exclusively in the city of London, yet the county justices and the sheriff of Surrey have continued to exercise jurisdiction in the borough; and great doubts have arisen, and do now exist, in the minds of the inhabitants, whether justice is administered in Southwark according to the law, and who are the proper officers to execute His Majesty's writs and precepts, which doubts and difficulties it is most desirable should be removed: That at a court of aldermen, holden at the Guildhall of London on the 20th of May, in the same 4th year of King Edward the VIth, the town and borough of Southwark was named and called the ward of Bridge without; and Sir John Ayliffe, knight, was elected alderman thereof; and at a court of common council, holden on the last day of July in the same year, it was enacted, that besides the then accustomed number of twenty-five aldermen, there should be one alderman now elected to have the charge and government of the said borough and town; and that four discreet persons or more, being freemen of London, and dwelling within the said city or borough of Southwark, or the liberties of the said city, should, as often as the case should require, be from time to time nominated by the inhabitants of the said borough, before the lord mayor of London, sitting in the borough for that purpose; and that the lord mayor, at the next court of aldermen, should present the names of the persons so nominated; and the lord mayor and aldermen for the time being should, out of the persons so nominated, elect one to be an alderman of the said city, or to have the ordering rule and government of the said borough and town of Southwark, and of the inhabitants thereof, which act, at a common council held on the 16th day of June, in the 4th and 5th years of King Philip and Queen Mary, was repealed; and it was enacted, that from thenceforth, on a vacancy happening, the alderman of the said ward should be elected and chosen by the lord mayor and aldermen, at a full court of aldermen: That although the borough of Southwark, by virtue of the said act of common council, founded on the same charter, is one of the wards of the city of London, yet the freemen inhabitants thereof are not represented in the court of common council, nor has the alderman of Bridge ward without, as such, any deputy, nor is he elected by his ward, as other aldermen of the city of London are; nor is any court of wardmote for correcting disorders, removing annoyances, and promoting the common interest of Bridge ward without, held in the said ward: That by reason of the rights and privileges of the borough of Southwark not having been supported and maintained, the inhabitants of this

antient

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antient town and borough have become subject to have soldiers quartered on them, and liable to the county militia, and do bear and pay a very large proportion of the county rate, which is expended in the salaries of the county coroners and clerk of the peace for the county, in the support of the county gaols and sessions house, in repairs of bridges, and in prosecutions of felons for offences committed out of as well as within the borough, although the borough has a coroner and clerk of the peace, and gaols and sessions house peculiar to itself, paid and maintained by the city of London, to whom the bridge belongs; and although justice may be more speedily obtained for offences committed in the said town and borough, at the borough sessions, and at less charge, your humble memorialists and petitioners humbly pray. that the lord mayor and commonalty and citizens of London, will fix an early day to take the said charter of the fourth of king Edward the Sixth into their serious consideration; and that they will take such steps as they in their wisdom shall deem expedient, for procuring for the inhabitants of this antient town and borough, the rights and privileges thereby granted to them, and to restore the magistracy of the city of London in Southwark; and that the mayor and commonalty and citizens of the city of London, will be pleased to direct the judge and officers of the antient court of record of the said town and borough, to make public in Southwark, the jurisdiction authority and existence of that court, and that steps may be taken to re-establish the same, as well as the session for the said borough, and that process may be duly executed in Southwark according to law, and all doubts be removed as to who are the proper officers to execute the same; and that the said mayor commonalty and citizens of London, would be pleased to order proper measures to be taken for holding a court of wardmote in the said borough, to elect a competent number of inhabitants, freemen of the city of London, to represent the said ward in the court of common council; and that the court of common council would be pleased to re-consider the act passed by them, of the 16th of June, fourth and fifth of king Philip and queen Mary, for altering the mode of electing the aldermen of the Bridge ward without, and on the next vacancy to restore to the inhabitants of this antient town and borough, the right of electing an alderman for the said ward, in the manner directed by the act of common council, passed on or about the last day of July, in the fourth year of king Edward the Sixth, or in such manner as the aldermen of the twenty-five other wards of the city of London are now by law elected.

" *Harrison* & *Ellis.*
*William Bouring.*
*William Sentance.*
*C. Scarborough.*
*Jas. Barber.*
*Geo. Gatehouse.*
*Thos. Woolford Jones.*
*Thos. Bunney.*
*Rt. Bousfield.*
*Isaiah Robert.*
*John Hopkins*, F. & L.

For Sir *Watkin Lewes*, high bailiff,
*John Holmes*, deputy.
*Joseph Jones*, F. & L.
*Richard Corner.*
*Jas. Jukes*, F.
*G. A. George.*
*Samuel Darnell*, F. & L.
*P. G. Coleman*, F. & L.
*Robert Pickup.*
*William Barnett.*
*William Kemmish.*"

A Cart would water in Regent Street about 51200 Square yards of surface per day - quantity of water about 32 loads at 230 gallons ℘ load

But in consequence of having the water from Pumps it is supposed that one cart would scatter on the metropolis roads about 20 loads of Water per day at 230 Gallons each load - the amount of surface, supposing the road to be watered about 42 feet wide, 32000 Square yards or about one mile and one third in length per day.

The above supposes the road to be watered only once in the day.

Cost by pumping
1/3 of time of horse and man $2^{s}/6^{d}$
Two men pumping $2^{s}/4^{d}$ per day $\underline{4^{s}/8^{d}}$ $7^{s}/2^{d}$

20 loads of 230 gallons each make 4600 Gallons at one penny ℘ barrell of 36 gallons is $10^{s}/8^{d}$.